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Bulletin of the Entomological Society of America

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SUSTAINING ASSOCIATES

It is always pleasant to welcome a new SUSTAINING ASSOCIATE into the Entomological Society of America. The following addition to the list is herewith acknowledged.

DIAMOND ALKALI COMPANY
300 Union Commerce Building
Cleveland 14, Ohio

Our move of the Washington office to the Society's new home in College Park, Maryland was discussed in the December 1959 issue of the BULLETIN. The move on top of year end business resulted in our not getting letters out to our SUSTAINING ASSOCIATES in time for 1960 renewals to be announced in this issue of the BULLETIN. Some are in but we will hold these and announce the entire group in the June BULLETIN.

This issue of the BULLETIN contains the Auditor's Report for the Society's Fiscal Year 1959. We wish to call two items to the attention of our SUSTAINING ASSOCIATES.

1. Under "Receipts" for the General Fund it will be noted that the Society received $4,200.00 from SUSTAINING ASSOCIATE fees in 1959.

2. A little arithmetic will show that the General Fund ended the year $1,504.55 in the black. Where we would have been without our SUSTAINING ASSOCIATES is obvious.

We have mentioned the new home of the Society. In previous issues of the BULLETIN we have commented upon the possibility of a SUSTAINING ASSOCIATE specifying that their 1960 fee be used to purchase a brass replica of the Society seal to put over our front door and that our projected Board Room does not have furniture. These examples are again called to the attention of any SUSTAINING ASSOCIATE who may be interested. Those SUSTAINING ASSOCIATES who wish their fees to be used only toward the payment of publication costs of the JOURNAL OF ECONOMIC ENTOMOLOGY may so specify and it will be done.

UNION CARBIDE CHEMICALS, 30 East 42nd Street, New York 17, New York, has announced the promotion of ESA member Dr. Richard C. Back to Manager, Technical Development, Crag Agricultural Chemicals in New York City. He will also serve as a member of the Company's Agricultural Chemicals Marketing Committee. This SUSTAINING ASSOCIATE has also announced the appointment of Richard W. Bagley to the Sevin® product group of Crag Agricultural Chemicals. Mr. Bagley, who is also an ESA member, will be Dr. Back's assistant.

CALIFORNIA SPRAY CHEMICAL CORPORATION, Richmond, California and Washington, D. C., issued the following release in December 1959. The National 4-H Clubs announced the national winners of two agronomy-plant pathology scholarships sponsored by the CALIFORNIA SPRAY-CHEMICAL CORPORATION. The winners were Mr. David P. Winkelmann of Ashland, Illinois, and Mr. Ronald McKeever of Wymore, Nebraska. The Scholarships were in the amount of $800 each and are intended to assist the recipients in their senior years of college studies. Calspray inaugurated these scholarships in 1957 as part of their 50th anniversary celebration.

AUTOGRAPHA O O

CHANGES. The 20th Century is a great time for changes. Please note our new address and telephone number in the masthead on this page and make the necessary changes in your records. If you live in a Direct Distance Dialing area you can telephone us by dialing 202-UN-4-1334. This change of headquarters involved many adjustments and it will be some time before we are back on a prompt answer, quick service basis. Please bear with us.

CODES. The addressograph plate of each member, which is used to address copies of the ANNALS, BULLETIN and JOURNAL OF ECONOMIC ENTOMOLOGY, contains code letters. A member who receives the ANNALS has a plate coded MA, for the JOURNAL OF ECONOMIC ENTOMOLOGY the code MJ, for both MJA and so on. In many instances this code follows the member's name, although as new plates are made we are moving it down to the second line. In placing the code after members' names we have caused problems in a few cases. Please note that if an MA appears on your address as put out by this Society that it means "member who receives the ANNALS" and not Master of Arts! We make our addressograph plates as simple as possible and yet try to include all information essential to the postal service. We do not include degrees or titles except for military and clerical personnel.

CHALLENGES. The Society's office is now in the new home as mentioned above. We are finding out the hard way that we need brooms, mops and snow shovels as well as typewriters and stationery. The book someone wants may be in the attic or the basement—and may Allah guide our search! In spite of all this we invite you to drop in when you pass our door. We have no illusions regarding future problems. At the same time we are sure of their ultimate solution. We hope that each member will give serious consideration to the Building Fund of the Society. A loyal member recently contributed 3 shares of valuable Common Stock. Others have made cash gifts.

CONGRESS. A short piece on the inside front cover of the December 1959 issue of the BULLETIN noted that funds had been made available to the Society for travel assistance for a limited number of entomologists to the XIth International Congress of Entomology in Vienna on August 17–25, 1960. We received 143 completed applications for grants. The *Committee on Travel Grants* reviewed each one of these applications carefully and at length. The funds available permitted the selection of 41 entomologists. The Editor, under his hat of Executive Secretary, was pleased to write these 41 individuals of their selection. He was not happy in writing the 102 letters of regret but did so knowing that the members concerned were scientists of understanding.

COPY. This issue of the BULLETIN may be late because the "flu" (a word covering many ills, all evil) laid 3 of the ESA staff low and our copy for the printer could not be prepared promptly. In short we had deadline trouble. All Society members who expect to present papers at the Atlantic City meeting this year can prevent deadline troubles for themselves by carefully noting the following.

The new deadline for titles and synopses of papers for the annual meeting is August 15. The chairman of the *Program Committee*, R. W. Sherman, will issue a call for papers later. In the meantime plan toward this new deadline of August 15.

ESA and You

A MESSAGE FROM YOUR PRESIDENT

By M. P. JONES

"What's in it for me?"

Ask people to do something and that's usually their immediate reaction—even if unspoken. And this is even more likely if what we're asking them to do costs money.

There's nothing wrong with this attitude. This is simply human nature in action. For that reason, in my message to you, I'm going to emphasize what you gain by having a Society and by being a member of this Society. In other words, what you are getting for your $13.

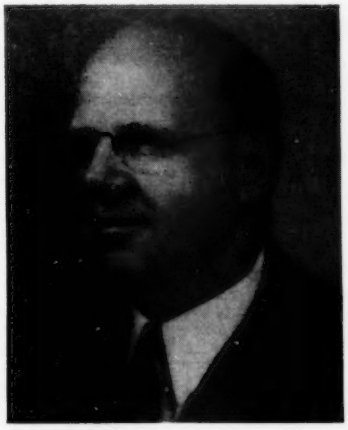
First, the mere fact that you've spent quite a few years in college working for a B. S., an M. S. or perhaps a Ph. D. degree in entomology expresses your interest in that profession and should make you anxious to advance it. And there's no doubt in my mind that the amalgamation of the two Societies has done just that.

The Society in effect provides a focal point for entomology in North America.

Perhaps you aren't aware that the Society has 4,300 members with worldwide representation. That its annual budget is well over $100,000. That it recently purchased its own headquarters building. That it has a full-time Executive Secretary who devotes his untiring efforts to the overall interests of the Society. That a staff of seven paid employees is necessary to handle the affairs of the Society. That the Society underwrites and publishes these nine publications:

ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA
JOURNAL OF ECONOMIC ENTOMOLOGY
INDEX OF AMERICAN ECONOMIC ENTOMOLOGY
MONOGRAPHS OF THE THOMAS SAY FOUNDATION
THE ANNUAL REVIEW OF ENTOMOLOGY
MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA
THE BULLETIN OF THE ENTOMOLOGICAL SOCIETY OF AMERICA
ENTOMA—PEST CONTROL DIRECTORY
OPPORTUNITIES IN PROFESSIONAL ENTOMOLOGY

Membership in the Society permits free publication of your work in these publications. It entitles members to copies of the BULLETIN and either the ANNALS or the JOURNAL, and in North America and United States possessions the *Bulletin of the A. I. B. S.* (The American Institute of Biological Science) as well. You can buy other publications of the Society at special membership rates.



M. P. JONES

Where would you publish your work in applied entomology if it were not for the JOURNAL, or where would you go to find a record of what has been published if it were not for the INDEX, the JOURNAL, or the ANNALS? One of the first questions asked when a person seeks employment in our field is "What have you published?" The JOURNAL and ANNALS offer you such outlets. Employers also want to know the professional society to which you belong. Membership suggests that you are one of a team working for the common good. The Society maintains an employment register for the benefit of members.

Where would you find as comprehensive treatment of specific subjects as in the ANNUAL REVIEW OF ENTOMOLOGY? Also what other publication would keep you as well informed on what entomologists are doing, or what is going on in entomology as the BULLETIN?

In many quarters, entomology is recognized as a separate and distinct profession, because we are organized into an active and going Society.

There is strength in numbers—in our own society, and in our affiliation with other organizations of broader scientific interest. We are represented in the American Association for the Advancement of Science (AAAS), the National Academy of Sciences—National Research Council (NAS-NRC) and its Agricultural Research Institute (ARI), and the American Institute of Biological Sciences (AIBS). In this way, we play our part in matters of concern to agriculture and biological science as a whole and to science in general. Conversely, these cooperative, overall organizations can and do help us in matters of our particular interest.

As a single National Society, we are able to acquire special funds to send American entomologists abroad and to bring outstanding foreign entomologists to this country. Examples are our delegation to the International Congress of Entomologists in Vienna, Austria, and special funds to finance foreign speakers at our annual meetings.

The fact that we have our own professional society has played an important part in the organization and retention of departments of entomology in our colleges and universities and State and Federal Governments.

These are just a few of the things you are getting for your $13. Perhaps you're still not convinced you're getting all you'd like out of the Society. If not, chances are you haven't let your wants be known. Have you written to the officers of your branch or parent society, or have you participated in discussions at the annual business meetings?

Of course, almost everything is comparable to a two-way street. We can't get much out of our Society unless we put something into it.

And we need only to examine the Society structure to observe some of the opportunities for service. There are approximately 300 elective or appointive assignments in the parent organization and the 5 branches. About 200 members are serving on committees of one kind or another —almost 50 as officers,—25 as members of editorial boards, and approximately a dozen serving on boards or committees of other societies representing ours.

Any member who actively participates in the business meeting or affairs of the Society or its branches will soon discover ways he can help the profession and himself. Sooner or later you will find yourself assigned to some com-

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mittee or board or elected to some office. Two such committees are the *Committee on Professional Training, Standards and Status* and the *Public Relations Committee.*

But the big public relations job is wide open, and is the responsibility of all of us. Many groups are constantly on the lookout for scientific talent, and are eager to give a spot on their program for a discussion of some phase of entomology. They are also vitally interested in obtaining help in other ways. Science fairs, as well as science teachers and their classes, need help. The 50,000 members of 4-H Entomology Clubs and their local leaders need more personal attention. Civil and Service clubs are constantly seeking interesting program material—material we have at our fingertips. Junior colleges would offer courses if they could get our help in outlining courses and teaching. An hour or so a month devoted to one of these activities pays big dividends to the profession and our time is well spent.

Here are a few subjects of general interest you might discuss:

Insects live under extremely wide range of conditions of temperatures, moisture, and light.

There are more than 700,000 described species of insects.

Relatively few kinds of insects are pests.

Several billion dollars worth of crops, livestock, and property are lost to insects each year.

Were it not for control measures presently applied, the loss figure would be staggering, even by present-day standards.

Insect control is a several billion dollar business.

Insects are important to man in producing certain fruits and seeds.

Because of insect control we have highest quality foods of any country.

Epidemics resulting from lack of insect control have cost the lives of people (21 deaths, 32 illnesses owing to encephalitis in New Jersey in 1959).

Entomologists are in foreign countries hunting for beneficial insects to control pests in this country.

These are just a few of the interesting things we can tell people about entomology. The literature is full of other examples.

So when we sell entomology, we help sell our profession, strengthen our society, and finally, help ourselves. This discussion, I think, answers the question: "What's in it for me?"

ENTOMOLOGY CLUB AT RUTGERS

The Rutgers University Entomology Club, made up of all undergraduate students who have an interest in insects, is a new organization at that institution. Staff members and graduate students can be associate members of the club. Monthly business meetings with speakers are held and several field trips will be made during the school year. The club now has 15 members. Officers are: Emil Moharek, President; Donald Whitehead, Vice-President; John Moroze, Secretary-Treasurer.

PRITCHARD-BAKER MITE BOOK STILL AVAILABLE

We have been informed by Dr. E. G. Linsley, Chairman of the Publication Committee of the Pacific Coast Entomological Society, that in spite of heavy demand, copies of *The Spider Mite Family Tetranychidae* by A. E. Pritchard and E. W. Baker are still available at the original price of $10.00. This world-wide treatment of the spider mites was first published in July, 1955. Copies may be obtained from the Treasurer, Pacific Coast Entomological Society, California Academy of Sciences, San Francisco 18, California.

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

Notice of proposed use of Plenary Powers in certain cases (A. (n.s.) 43)

In accordance with a decision of the 13th International Congress of Zoology, 1948, public notice is hereby given of the possible use by the International Commission on Zoological Nomenclature of its plenary powers in connection with the following cases, full details of which will be found in *Bulletin of Zoological Nomenclature*, Vol. 17, Parts 3/5, to be published on 15 December 1959:

(1) Designation of a type-species for the nominal genus *Bolitochara* Mannerheim, 1831 (Class Insecta, Order Coleoptera). Z.N. (S.)243;

(2) Designation of type-species for the nominal genera *Ischnopoda* Stephens, 1835, and *Tachyusa* Erichson, 1837 (Class Insecta, Order Coleoptera). Z.N. (S.)244;

Any zoologist who wishes to comment on any of the above cases should do so in writing, and in duplicate, as soon as possible, and in any case before 15 May 1960. Each comment should bear the reference number of the case in question. Comments received early enough will be published in the *Bulletin of Zoological Nomenclature.* Those received too late for publication will, if received before 15 May 1960, be brought to the attention of the Commission at the time of commencement of voting.

All communications on the above subject should be addressed as follows: The Assistant Secretary, International Commission on Zoological Nomenclature, c/o British Museum (Natural History), Cromwell Road, London, S.W.7. England.

W. E. China, *Assistant Secretary*
International Commission on Zoological Nomenclature
November, 1959

NECROLOGY

Barber, H. G. 88. Retired USDA Hemipterist. Former science teacher. Charter member of former Entomological Society of America. Emeritus member. In Doctor's Hospital, Washington, D. C., January 27, 1960.

Hamilton, Clyde C. 69. Economic entomologist. Forty-five year member. At his home in New Brunswick, New Jersey, December 13, 1959.

Hassler, Karl. Pest Control Operator. At his home in Altadena, California, January 9, 1960.

Hutton, R. W. Commercial entomologist. At his home in Toronto, Canada, October 12, 1959.

Sturtevant, Arnold P. 70. Bacteriologist and Apiculturist. At his home in Laramie, Wyoming, September 17, 1959.

Viale, Emilio. 38. Economic entomologist with Hercules Powder Company. In Wilmington, Delaware, December 23, 1959.

Welch, P. S. 76. Retired University of Michigan teacher. Forty-six year member. Fellow in the former Entomological Society of America. Emeritus member. At his home in Ann Arbor, Michigan, October 1, 1959.

INSECT FILMS

Information on an appreciable list of moving pictures on the honey bee and on beekeeping may be obtained by writing Mr. A. S. Michael, Bee Culture Laboratory, Building A, Research Center, Beltsville, Maryland.

Encyclopaedia Britannica Films has announced a second edition in color or black and white on The House Fly. For information, write them at 1150 Wilmette Avenue, Wilmette, Illinois.

The Relation of Insect Taxonomy to Applied Biology

By P. W. OMAN[1]

Entomology Research Division, Agricultural Research Service
United States Department of Agriculture

IT IS GENERALLY RECOGNIZED that some speakers appearing before organizations such as these have certain advantages that derive from their stage of scientific maturity. I refer to the very young and the very old. The youngsters, having established no pattern of professional behavior, can turn the shining light of optimism on the future and speak of things to come—better things, of course—with reasonable assurance that no one will be so discourteous as to look at the record a few years hence. The oldsters, knowing full well that they will not be saddled with the responsibility for implementing suggestions, can with equal impunity assume the role of elder statesmen and give advice. It is the mass of in-betweens, among whom I place myself, that lack these advantages and, in consequence, often find difficulty in their speaking assignments. If we indulge at all in criticism it is pretty easy to check and see if the speaker is painting himself with the brush he holds. This knowledge engenders a certain amount of caution and makes one wish he had chosen to speak on some subject with which he has no direct connection. But titles of papers must be submitted well in advance of meetings, and the hazards of the trail are seldom apparent when the expedition is being mounted.

So, having maneuvered myself into the position of talking about activities with which I have been, still am, and hope in the future to be intimately associated, I have little choice but to admit to some measure of responsibility for whatever shortcomings exist in the conduct of these activities. If I seem critical of the way things have been done, remember that I include myself among those being criticized. I approach my subject with the advantage of hindsight which, though less desirable than foresight, is better than no sight at all.

The topic on which I have chosen to speak has been rather thoroughly aired in entomological circles. No less than five papers dealing with segments of the subject were published in the October 1942 number of the Journal of Economic Entomology, and a sixth appeared in the same Journal in December 1955. I therefore assume that the existence of a relationship between taxonomy and applied biology is well established, and that I may proceed immediately to the limited aspects of the topic that I wish to scrutinize. Those who wish a detailed discussion may consult the series of papers referred to earlier, beginning with that by Ferris (1942) entitled "The Needs of Systematic Entomology," and continuing as far as their interest takes them. Other papers in the series are by Essig (1942), Clausen (1942), Frison (1942), Muesebeck (1942), and Sabrosky (1955).

Today I shall speak to the thesis that taxonomic entomology and applied biology should be but parts of a coordinated whole; that each discipline has much to offer the other, but that the advantages of close coordination and cooperation are not being fully realized; and that the fault for this failure lies with both the taxonomists and the applied biologists.

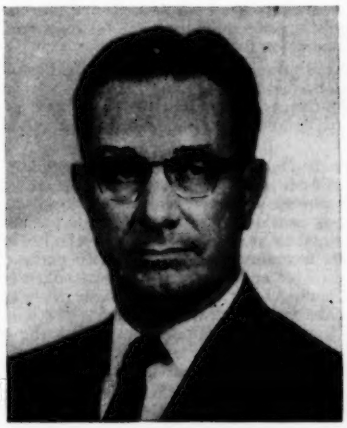
In the interests of brevity, the term "taxonomy" will be used to mean the taxonomy of insects and mites. References to applied biology will be mostly concerned with applied or economic entomology, and references to biologists mean workers in applied biology.

Taxonomy, or systematics if you prefer, is concerned with the arrangement of organisms in an orderly manner, according to their structural and physiological relationships. Applied biology is concerned with the application of biological knowledge to the practical needs of man. It will therefore be immediately apparent that a large part of the activities of taxonomists—the part that in any way supports or extends the work of applied biologists—becomes itself applied biology. The use of taxonomic information to further the practical needs of man is the common meeting ground for these two disciplines.

There is no fundamental reason, inherent in the scope of these two disciplines, why they cannot be closely coordinated. Then for an explanation of whatever failure of coordination exists we should look among the habits, customs, and prejudices of their practitioners. And to understand these we need some appreciation of the historical development and functions of the two specialties, particularly taxonomy.

The principal functions of taxonomy are three:—(1) discrimination among species, (2) grouping of taxa (species, genera, tribes, and so forth) so as to reflect their interrelationships, and (3) interpreting the significance of the groupings arrived at. The naming of species is a more or less incidental activity necessary to facilitate reference to the elements treated. The identification of species is merely the application of the criteria developed and tested during the processes of species discrimination and grouping.

To accomplish these principal taxonomic functions, the taxonomist may employ any means available in order to arrive at a knowledge of the biological facts. The data customarily used consist of morphological, physiological, genetic, behavioral, and distributional evidence. If we ignore the individual ability of the taxonomist, which we of course cannot, the value of his work will be in direct proportion to the evidence available and to the time he is able to devote to the problem. It is therefore to the advantage of the biologist to place as much evidence as possible at the disposal of the taxonomist—and to see that he has time to use it.



P. W. OMAN

[1] In Charge, Insect Identification and Parasite Introduction Branch, Entomology Research Division, A. R. S., U. S. Department of Agriculture, Presidential Address, 1959 Annual Meeting in Detroit, Michigan.

The taxonomist commonly works with general information about a great number of species, whereas the applied biologist is more likely to be concerned with detailed knowledge about a few. Applied entomologists, for example, have directed their attention almost exclusively to the few species that are of direct economic importance to man. For this reason taxonomists are usually the first to be consulted when some information of a general nature about insects is needed.

Of course there is nothing inherently wrong with such an arrangement, so long as the demands for information remain within reasonable bounds, which they do not, and are all related to well-planned projects, which they are not. It is when taxonomists become smothered with requests for service work that cries of anguish are raised in the land. And that is the situation that exists today, as a result of piling more and more obligations, year after year, onto an already overloaded few. Many taxonomists are so busy dispensing their meager stores of information that they find no time to contribute new knowledge. Yet any taxonomic entomologist worth his salt will tell you that most of the critical work in his field lies ahead.

I contend that this state of affairs, bad as it is for taxonomy, will become equally bad for applied biology if allowed to persist. Progress in science depends upon related specialties moving forward more or less in unison; one laggard holds back his immediate associates, and soon the whole chain comes to a halt. If you doubt this—if you doubt that taxonomy and applied biology must go hand in hand—I suggest that you recall the confusion introduced into the study of the biology of the primary screw-worm because of failure to differentiate between the primary and secondary screw-worm flies, or the unsuccessful search in South America for the beet leafhopper when it was actually to be found in the Old World.

If taxonomy is to be of maximum usefulness to applied biology it must continue to be creative. It cannot rest on whatever laurels it has and concern itself solely with the application of existing knowledge. Too much research remains undone. In order that time may be found to accomplish that needed research, the problem of meeting a greatly increased demand for service work must be solved. And this problem is as much, or more, the responsibility of applied biology as it is of taxonomy. Here is an area where cooperative effort is urgently needed.

Now it would be very easy for me to say that the solution to the problem of increased demands for service is more support for taxonomy. That more support is needed cannot be denied; in fact, the problem will not be solved without a great increase in funds. But that is not the whole story. I am of the opinion that we can improve the situation considerably if we create better understanding between the workers in these two disciplines. Once mutual understanding and confidence are established, more and better cooperation follows.

The first step in developing better working relations between taxonomists and applied biologists is recognition of the circumstances and conditions that may lead to misunderstanding and distrust. Toward that end I list the following:

(1) *The quality of much work in both taxonomy and applied biology has been poor, and the results of questionable value.* Biologists who have been victimized by sloppy taxonomy—and there is considerable included in that classification—are disinclined to have faith in that method of study or to support it. Taxonomists called upon to make qualitative and quantitative analyses of the insects collected during a survey of some "back forty," are likely to hold the view that the chief value of the resulting list of scientific names will be to impress the station director with the industry of the "biologist." After repeated experiences of this sort, they become soured on applied biology in general.

(2) *There is a tendency among taxonomists to devote a disproportionate amount of time to taxonomic rarities, and to ignore or neglect the many troublesome but interesting problems that exist in our economically important groups of insects.* This tendency is very much akin to what James Slater, in a recent talk before the Eastern Branch of the Entomological Society of America, referred to as "dilettantism." As Dr. Slater so aptly put it, "in no modern scientific discipline is the fiddling around quite so obvious as in taxonomy." Also, taxonomists frequently become unnecessarily enmeshed in problems of nomenclature, and the endless description of species, with the result that the more important functions of species discrimination and grouping are neglected, and the interpretations dependent upon these functions are impossible.

(3) *Biologists, and some taxonomists, are not sufficiently conscious of the impact of numbers on the practice of taxonomy.* The existence of an enormous number of kinds of insects has made it impossible for taxonomists properly to assimilate, organize, and interpret the information available about them. Biologists, on the other hand, fail to understand how a job that has been under way for more than 200 years can still be largely unfinished.

(4) *Some taxonomists refuse to use, or even learn anything about, contributions made in other scientific specialties that might be useful in taxonomy.* They too often forget that species have physiological as well as morphological characteristics, with certain capacities and behavior patterns. The other side of the coin is that biologists often seem indifferent to specific requests for biological evidence that would permit taxonomists to make the desired interpretations.

(5) *Taxonomists often feel that their specialty is not generally understood, but do little to correct the situation.* On the contrary, they seem more inclined to present their research results in such a way that only another specialist in the same limited field can appreciate the significance of their findings.

(6) *The managerial philosophy of compartmentalization has too effectively isolated taxonomy from other biological science specialties, and made scientific intercourse difficult.* Given the opportunity for more personal contacts, both taxonomists and biologists will benefit from the intellectual jostling that is a part of the free interchange of ideas.

Many of these problems in relationship are simple and the solutions obvious. Others, being more complex, will require community action for correction. What of these?

I have a few suggestions:

First of all we need to face the hard fact that a handful of taxonomists is trying to do a job for which there should be 10 times as many workers. The potential demand for information derived from taxonomic studies appears unlimited. If this is true—and the experiences of the USDA insect identification unit during the past 20-odd years strongly indicate that it is—then it becomes obvious that a long-range solution is necessary. Contributed help is not the answer, except perhaps for the most urgent of emergencies. That approach will produce neither the quantity nor the quality of taxonomic work we must have to meet the needs of our expanding economy and emerging world leadership. Several years ago Ferris (1942), speaking to the economic entomologists, put it this way: "If you have at times been disgusted with the inadequacies of our systematic work; if you feel that it should be done better than it has been done; if you want it done in such fashion that it affords you the help that you need in your work;—then it is up to you to do something about it. As long as you go on cadging your systematic work from systematists like a panhandler cadging dimes and cigar butts, dimes and cigar butts are all you are likely to get." Now, mindful that Kelvin Dorward and I have recently invited the voluntary participation of numerous taxonomists in an insect identification program, I hasten to assure them that I am not comparing their work with dimes and cigar butts. We simply need more manpower.

I think it would surprise many of you to know how much personal time taxonomists devote to work of primary interest to applied biology. This phenomenon of scientific self sacrifice has variously been referred to as "dedication

to duty," "esprit de corps," and a lot of other flattering expressions. Actually, the little woman probably hits close to the truth when she accuses her insect-minded mate of caring more for his old bugs than he does for her.

The point I want to make is that taxonomists, being "dedicated to duty," are prone to assume more obligations than they can reasonably meet, even if they work those extra hours that are spent in scientific consultation with their colleagues, otherwise known as coffee breaks and bull sessions. The result is that most taxonomists have, stashed away in their laboratories, tremendous accumulations of material that they are either too kindhearted to return or that they actually believe they will "work over in the near future," as they have optimistically agreed to do.

Of course the taxonomist is scarcely free of guilt in connection with this backlogging of obligations. Often he goes to much trouble to assemble a large quantity of material, ostensibly for use in preparing a "monograph" of some group, and then proceeds to graze in some other pasture for the next 10 years. Or, relatively early in his professional career—as soon as he thinks he can get away with it—he stakes out a rather large territory as his own domain, and aggressively defends it against any interlopers who show an inclination to work in, and therefore "mess up," his particular territory.

What this all adds up to is that taxonomists have sometimes not been very smart in organizing their limited manpower to attack the problems at hand. A bit more intradiscipline coordination would help. The insect taxonomists might well emulate the North American acarologists, who have done an excellent job of cooperating on the taxonomy of a difficult group. My hat is off to them for this well-coordinated effort.

So we need more and better coordinated manpower in taxonomy. What else?

Permit me, at this point, to say a few words about this business of identifying insects. You hear a great deal about the burden of grinding out routine identifications and the time that it requires of highly trained taxonomists. I say that if it is really a routine operation it should not require the attention of an expert. It can be done by someone with a less elaborate background in taxonomy. Too frequently we confuse volume with routine. One of the great tragedies of our present system is that, although men spend a scientific lifetime becoming proficient in taxonomy, we neither use their talents efficiently nor permit them the opportunity to record their knowledge before they pass on. We simply cannot afford this waste of scientific talent; yet it continues.

We need more manual-type publications, similar to Foote and Cook's "Mosquitoes of Medical Importance" (1959), so that biologists can answer for themselves that oft-repeated and so necessary question "What is it?"

We need either to give taxonomists the opportunity to obtain useful data from the fields of genetics, chemistry, serology, and so on, or else to stop criticizing them for not using such evidence.

We need automation. Our accumulated, and still rapidly accumulating, records relating to insects—the data that taxonomists organize and store and that both applied biologists and taxonomists need in their work—have become so voluminous that they cannot be handled manually. Some supposedly responsible scientists are even talking glibly about its being cheaper to do research over again than to search our records for what has already been done. Perhaps it is, with our present methods, but to me this philosophy seems nonsense. Qualified research workers are already in short supply—why intensify this shortage by repetitious research? Let us look to the future, take advantage of modern technology, and develop a widely applicable coding system that permits machine storage and retrieval of scientific information.

Finally, recognizing the interdependence of these disciplines, we need to give meaning to the philosophy of teamwork that I am sure already exists. One way this can be done is for program officials to encourage taxonomists to participate in program planning, including the allocation of funds, if you please, whenever projects under consideration impinge in any way upon the field of systematics. Workers in applied biology need to recognize that they are constantly indebted to taxonomists for various essential services. And the taxonomist, on his part, should keep in mind the needs of applied biology and remember that public support for his activity is largely derived from the impetus given the whole field of biology by the importance of its purely economic phases. As my late and esteemed associate, Carl Heinrich (1924) once stated the situation, the taxonomist "is not altogether a free agent; his work is not something that concerns himself alone, or only those who chance to share his interests. He is an essential co-worker in a common cause; his work is a necessary part of a science of the greatest economic importance"—and—"this fact imposes certain moral obligations"—upon him.

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BSCS NEWSLETTER

To keep the biological community, educators, administrators, and other interested persons informed of its plans and progress, the Biological Sciences Curriculum Study will issue a series of *Newsletters*. The initial number is concerned largely with the early development of the Study and its present organization. Future *BSCS Newsletters* may contain short articles about particular aspects of the Study, announcements of new participating members, descriptions of projects, synopses of research studies nearing completion, and reports of committee deliberations.

Dr. Walter Auffenberg, Assistant Director of the BSCS, University of Colorado, Boulder, Colorado, is serving as editor of the *Newsletter*. He reflects the feelings of all of the participants in the Study in expressing the hope that the *Newsletter* will become an important means of communication for the BSCS with those persons seriously interested in education in the biological sciences. Effective communication, however, is a two-way process. We are anxious to learn what reactions our readers have to the present operation of the BSCS program and respectfully invite suggestions and comments that might lead to its improvement.

REDWOOD LIBRARY

A Redwood Library has been set up at the Redwood Ranger Station, Requa, California. This library would be most pleased to receive collections of books, papers, photographs or other material dealing with redwoods. The District Ranger may be written at the above address.

Biological Control in Forest Entomology[1]

By M. L. PREBBLE[2]

IT IS APPROPRIATE THAT biological control should have been selected by our *Program Committee* as the central theme of this first joint meeting of the American and Canadian entomological societies. The limitations and the frequent hazards of chemical control have been experienced by entomologists in both our countries. An additional bond of mutual interest is the extent to which we share many important insect pests, indigenous and exotic, and also many of the biotic agents introduced to combat them.

The concept of biological control has very wide application, but I propose to refer briefly to its application only in the restricted field of forest entomology. Restricted scope and brevity will avoid overlap with other speakers who will develop their contributions in greater depth and breadth. There is, moreover, a positive reason for dwelling on forest entomology: namely, to outline some of the advantages of the forest environment to the student of biological control.

The theoretical basis of biological control clearly depends on the existence, among the many things that influence host survival, of a "natural enemy" that is more or less host specific, has good searching capacity, an adequate rate of increase and dispersal, that reacts to environmental conditions favoring the host, and whose effectiveness increases with host density, if not immediately, then with no more than a short time lag. With these attributes, the introduced natural enemy by itself or in conjunction with other mortality factors is expected to prevent outbreaks of the pest species, or at least to damp down major population fluctuations.

Most such projects have as their objective the full "economic" control of a pest species, its permanent maintenance at reduced levels requiring no other form of control. Population ecologists seem to agree that the general range of population levels depends on food supply, climate, and other factors not responsive to host density, but not on the regulating mechanism that governs fluctuations. If this premise be so, permanent economic control is a very large objective, especially when one considers that fluctuations in a well regulated population may periodically still be sufficiently high to permit commercial damage to the crop.

It is in this context that the forest offers special opportunities for biological control. In general, the forest has three principal advantages. Its ecological diversity, expressed in rich flora and fauna occupying varied topographic sites, permits study of the many interactions involving the host tree, the pest insect, and the other biotic and abiotic elements of the community. Its freedom from annual upheavals in the form of cultivating and cropping practices, and the long time to timber harvesting, provide security for longterm observations and measurements. Its tolerance of repeated defoliation provides sound biological grounds for withholding chemical control in many instances. This tolerance of moderate injury also provides a basis for less exacting standards in biological control than would be acceptable to producers of many annual crops. In short, biological control of many forest insects might well be judged successful if, through the introduction of counterpests, the intensity or duration of outbreaks is reduced to less than tree-killing proportions.

As a prelude to a brief review of biological control of forest insects in North America, it is instructive to learn the viewpoints of scientists quite detached from the local scene. Three examples will suffice. Referring to biological control in general, T. H. C. Taylor (1955) believes that the truly successful cases in the 50-year period ending in 1955 total less than 20 on a world basis; that the opportunities for equally good results in the future will be rare; and that the prospects for effective use of the method on a continental basis are not encouraging. A. Milne (1957) is not convinced that the available evidence supports belief that an enemy species by itself, or indeed, that several kinds of enemies acting in concert, can control a pest species at economic or any other stated level. Regarding apparently successful biological control projects, C. S. Elton (1958) notes that proof that counterpests have done the job without assistance from unknown causes or events is usually inadequate or totally lacking.

The record of biological control of forest insects in the United States was summarized by Clausen (1956), and I am indebted to J. A. Beal and P. B. Dowden, of the U. S. Forest Service, for recent supplementary comments in correspondence. The record for Canada is drawn from a compilation now being made by the Forest Biology Division and the Entomology Research Institute for Biological Control, at Belleville, Ontario. Control has been attempted in some 15 or 16 important introduced forest- and shade-tree pests. The effort has been about equal in the two countries, and eight projects are common to both. Useful results are judged to have been produced against the following species:

(a) the satin moth, the European spruce sawfly, the European pine sawfly, and the larch casebearer, in both countries;

(b) the gypsy moth, the oriental moth, the elm leaf beetle, and the European elm scale, in the United States;

(c) the lecanium scale and the holly leaf miner in Canada.

Projects for control of the balsam woolly aphid in both countries, and of the winter moth in Canada, are progressing. It is still too early for balanced assessment of results.

Twenty years ago the biological control of the larch sawfly in Canada would have been judged successful; but this conclusion is now in doubt, especially in the central regions, owing to encapsulation of the egg of the introduced parasite *Mesoleius* by the host larva (Muldrew 1953).

M. L. PREBBLE

[1] Contribution No. 607, Forest Biology Division, Research Branch, Department of Agriculture, Ottawa, Canada.

[2] Director, Forest Biology Division. Presidential Address, Entomological Society of Canada, Detroit, Michigan, November 30, 1959.

Among projects in other countries, one of the most interesting is the control of the eucalyptus snout beetle by an egg parasite in South Africa (Tooke 1955). This project has produced two conclusions of general interest: first, the successful employment of the method over a subcontinental area, with widely variable ecological conditions; and second, the fact that while control was effected promptly at low altitudes, some 15 years or more were required for the results to become evident in certain high-altitude areas.

A great deal of competent work has been done on the biology of the forest insects judged to have been brought under some degree of control, and on their parasites, predators, and diseases. However, with possibly one exception the field studies have not as yet produced the kind of data capable of demonstrating the regulatory effect of the introduced parasite, predator, or disease on the population fluctuations of its host. This is not to say the conclusions reached by intuitive means, by comparison of infestation behavior during time sequences before and after parasite introductions, or by other devices, are incorrect. Unfortunately, however, the majority of projects against forest insects make little direct contribution to questions of wide general interest, such as the distinction between *fully* and *partially* effective biotic agents; the estimation of probable ultimate results based on trends in the release area during the first 3 years; or the merits of a sequence of parasites or predators versus a single effective species (Clausen 1951, 1958; Thompson 1951; Sellers 1953).

The biological control of the European spruce sawfly is, I believe, an exceptional case, in that the published material includes important qualitative data, the record of infestation history, long-term data on host numbers and mortality, and also, a mathematical analysis of population trends over a 12-year period (Morris 1959). Some of the implications of this analysis will be referred to later.

If, as Taylor (1955) believes, the era of easy successes in biological control has passed, surely that assumption points up the need for more effective work than hitherto. We still have introduced pests that are "out of control" in the economic sense. There is no reason to believe that the flow of accidental introductions will cease. There is the added argument that the biological control of native species should be explored much more thoroughly. Some recent experiments with diseases of native defoliating species, for example the virus diseases of *Neodiprion* sawflies, suggest that microorganisms may be used more extensively in the future.

It has been stressed repeatedly that more intensive ecological investigations, combined with theoretical and experimental studies, are essential for new advances in both cultural and biological control (Thompson 1951, 1956, 1958; Cole 1957; Nicholson 1957, 1958; Solomon 1957). Basically, we are in a much stronger position in this respect than before. Important advances are being made in the principles and practices of insect pathology, parasitism, and predation; and in understanding the behavior of the insects we should like to control. In these fields, there has been a stimulating blending of field and laboratory observation and experiment and analytical procedure. We are better informed on our insect fauna than ever before. In seeking further improvement we are dependent upon and must collaborate with the taxonomists. In this connection, Dr. Oman's frank appraisal of the state of insect taxonomy "from the inside" should be helpful to taxonomist and applied entomologist alike. More accurate information on pest species, and on native and introduced parasites, is available through the forest insect survey organizations operating throughout the United States and Canada. For population studies improved sampling techniques and designs have been developed for many of the major forest pests. Criteria are available by which enlightened choices can be made between sampling systems having differing degrees of precision and usefulness (Morris 1960).

Recent advances in methods of analysis and interpretation should provide useful techniques for testing the effectiveness of biological control agents. In studies of the numerical relationships of host and parasite, Watt (1959) has synthesized a mathematical model in which the number of hosts attacked is a function of the number of parasites searching, the maximum number of attacks that can be made per parasite, a coefficient of attack, and the number of vulnerable hosts. In an application of Watt's model to extensive data on the spruce budworm and its parasite *Apanteles*, Miller (1959) found a high degree of accord between calculated and observed numbers of parasitized budworms in an array of 50 sets of data representing different plots over a period of years.

In simulated studies of the functional response involved in predation, Holling (1959) produced a model in which number of prey consumed is a function of prey density, rate of discovery by the predator, and time spent in consuming the prey. The model did not fit actual field data for small mammal predation, presumably because other components are involved in natural situations; but the functional response equation was satisfactorily descriptive of published parasite-host relationships representing a wide range of experimental and field situations.

A discriminating essay on the interpretation of field mortality data has been published by Morris (1957). Mortality from all causes should be measured through an appreciable number of generations and in different environmental situations, if an understanding of the population dynamics of the species is an ultimate objective of the study. A high or a low percentage mortality caused by a given factor, but remaining more or less constant from generation to generation, may be quite meaningless as far as population regulation is concerned. Variability in the effect of a given mortality factor, and its relation to host density, provide useful clues to the factor or factors regulating the pest population.

The same author (Morris 1959) has made an analysis of host population and mortality caused by parasites during some 12 consecutive years, in the black-headed budworm, a native species, and the European spruce sawfly. The object of the analysis was to discover whether the host population in generation n + 1 could be accurately predicted from host survival in generation n. The information required is minimal: a population count at the appropriate life stage in each successive generation and determination of the annual percentage parasitism at this life stage. The interesting result of this work is that, whereas generation mortality owing to parasites was low to moderate in these species, nevertheless predictability of host population in generation n + 1 from host survival in generation n was high. Predictability based on the action of parasites was further increased if account was taken of contemporaneous mortality, that is, mortality resulting from other factors than the parasites. Morris concludes that parasitism is a "key factor" in the populations studied.

As Morris stresses, such techniques of restricted data gathering and single-factor analysis are not a substitute for full lifetable studies in various habitats, especially where there is a prospect of discovering principles that can be applied in silvicultural control. On the other hand, single-factor analysis seems to be suitable in biological control experiments where limited human and material resources are available for long-term appraisal.

In recapitulation, the following points have, I believe, a particular relevancy in forest entomology:

1. Too casual an attitude seems to have prevailed in some of the earlier biological control projects. Preparatory ecological studies of the pest species were often of limited scope. Parasites were not infrequently released at inopportune times or places—sometimes, apparently, for no better reason than that there was a surplus beyond the needs of some other project.

2. In several of the well-conceived biological control projects, there have been inadequate follow-up studies on dispersal, and especially on assessment of the effectiveness of the introduced biotic agents. Even with limited resources it should now be possible to make up these deficiencies, using recently developed techniques.

3. Past failures, or perhaps it would be better to say past projects that did not lead to an obviously successful conclusion, might well be reopened if the pest species is still causing serious concern. Flanders (1959) has given excellent suggestions for investigations that need to be carried out in the source area of biotic control agents and for the principles to be followed in establishing colonies in the area where control is desired.

4. An all-or-none attitude seems to have prevailed toward biological control that is not in keeping with the results of careful ecological studies and is out of context with circumstances in the forest environment. A new biotic agent that does not "control" in the regulatory sense might still be a very valuable addition to the natural control complex, if it reduces the average level of population fluctuations to less damaging proportions. In this connection indigenous biotic factors deserve increased attention, as well as new exotics, and the possibility of increasing their effectiveness by ecological or cultural means should be further explored.

By this emphasis on past or present deficiencies and future possibilities, rather than on successes, I mean to imply that results of entomological studies in the forest potentially have much to contribute to principles of biological control, just as the biological control method has still much to offer in the practice of forest entomology.

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MEMBERS IN THE NEWS

HAROLD SCHNORRENBERG of Oklahoma City and MAURICE OSER of Denver were elected President and Executive Vice-President, respectively, of the National Pest Control Association at their October 1959 meeting in Biloxi, Mississippi.

E. W. LAAKE, retired from the U. S. Department of Agriculture, retired from the Dallas City Health Department, is now doing research for the National Disinfectant Company in Dallas.

E. F. KNIPLING, A. W. LINDQUIST, R. C. BUSHLAND and A. H. BAUMHOVER were four of the five scientists recognized as the " en of the Year in Service to Southern Agriculture" for 1959 by the *Progressive Farmer*. This was in recognition of the highly successful screw-worm research and control project.

CHARLES T. HOYT has been employed by the South Pacific Commission to study the control of insect-borne plant diseases in the island territories in the South Pacific.

R. C. BROWN has retired from the Division of Forest Insect Research, U. S. Forest Service, after 35 years as a federal employee.

E. G. LINSLEY retired as Chairman of the Department of Entomology and Parasitology for the Berkeley and Davis Campuses of the University of California on June 30, 1959. RAY F. SMITH was appointed to take his place. Dr. Linsley has received the honor of being appointed a Research Professor in the Miller Institute for Basic Research in Science for a two year period July 1, 1960–June 30, 1962. He will pursue a monographic study of the North American Cerambycidae and during the period of the appointment he will be relieved of all University duties except research.

J. ALEX MUNRO is the "Man on a Grasshopper" in a cartoon in a recent issue of the *Embassy Record* from Beirut, Lebanon. Nice write-up too.

R. H. PAINTER has received an $11,000.00 grant from the National Science Foundation to permit a two year study of Bombyliidae. This study will include an examination of types of American species of the family deposited in European museums.

ELECTRONIC MICROSCOPE COURSE

A special Summer Laboratory Course in Techniques and Applications of the Electron Microscope will be offered to qualified senior biologists and medical research workers under the direction of Professor Benjamin M. Siegel at Cornell University's Electron Microscopy Laboratory. The session will run from June 13 through July 1.

The course will include extensive laboratory work, lectures covering the basic principles and methods, and lectures on specific biological applications to be given by prominent guest lecturers. It is being sponsered by a grant from the National Science Foundation.

Requests for information and applications should be addressed to Professor Benjamin M. Siegel, Rockefeller Hall, Cornell University, Ithaca, New York.

Insect Pathology: Challenge, Achievement, and Promise[1]

By EDWARD A. STEINHAUS

Laboratory of Insect Pathology, Department of Biological Control, University of California, Berkeley

IN THESE DAYS WHEN many societies and scientific organizations are conferring awards and according honors to their members, it seems customary for the recipient to assume a substantial degree of nonchalance or sophistication, and to accept these honors with supreme self-confidence. In the present instance, however, and with all due respect to the selecting Committee, for me to assume such self-confidence would be not only indecorous but hypocritical as well. Therefore, without any attempt at such sophistication may I express my sincere gratitude and thanks to the Society, and to the sponsors of the Memorial Lecture, for this honor, and for this opportunity to share with you some thoughts pertinent to my field of principal interest.

In this connection, I cannot refrain from telling you of a happening that reveals just how surprised I was when I was notified of my selection for this task of honor. Last year, immediately after our distinguished colleague and my good friend Carroll Williams had thrilled us with his magnificent address, I turned to a friend sitting next to me and said with bold assurance, "I certainly feel sorry for the poor soul who has to follow Williams!" I assure you that I feel a hundredfold sorrier for that poor soul now.

E. A. STEINHAUS

Although each of the Memorial Lectures is in honor of a distinguished entomologist, I am told that the lecture itself need not be concerned with the man being memorialized. Nevertheless, I should like to say a few words about the man this year's Lecture esteems.

Much has been written about the life and career of Charles Valentine Riley (1843–1895). There is little I could add that most of you do not already know concerning the contributions and accomplishments of this eminent man who is generally recognized as having been one of entomology's all-time greats. L. O. Howard believed Riley's five most important contributions were: his famous Missouri Reports, the founding of the United States Entomological Commission, the establishment of a strong Federal organization of entomology (the Division of Entomology in the U. S. Department of Agriculture), his work with the grape phylloxera, and his role in conceiving and directing the first great and successful international experiment in biological control, which involved the introduction of the vedalia, an Australian lady beetle, into the United States to control the cottony-cushion scale. To these may be added his skills and productivity as a writer (having published more than 2,000 papers and notes under his own name and almost 500 additional ones with B. D. Walsh), and as an artist. Others have highlighted additional accomplishments.

As we all know, Riley was not without his critics and detractors, and it would be unrealistic to ignore this fact. What has been described as his "aggressive personality," "jealousy of credit," and "proneness to controversy" undoubtedly caused him some difficulties and enmity. It is not, of course, my place to praise or to adjudge this "leading citizen of American science" as he was called by one of his biographers. But I should like to say this: the more I have examined and studied the record of his life and activities, the more I am convinced that this industrious, talented, ambitious, and sometimes tactless man, to some extent at least, suffered from the jealousy and volubility of certain of his detractors, from one of the inherent difficulties in being an administrator (that is, the inability to please everybody), and from the fact that he died at a relatively early age (he was accidentally killed in a fall from his bicycle at the age of 52) before the mellowness which eventually tempers most men had had an opportunity to make amends and to set the record straight. One of his biographers has said that he died just when "the most useful period of his life was about to begin." This much seems clear: for every person who took offense or who disliked Riley, the many who admired and genuinely liked him were evident by the testimonies not only to his outstanding abilities, but to his pleasing social qualities, geniality, enthusiasm, love of nature, and his manner of encouraging and inspiring others. Measured by the heritage he left us through his work and contributions, and judged in the light of his times, we can do little else here but accord him the honor and gratitude he so justly deserves.

Although Riley lived at a time when insect pathology was in its formative stages, it is not surprising that his universal interest in all aspects of insect life included the early, timorous developments in the study of insect diseases. In a series of a dozen or so notes and short articles, beginning in 1872 and continuing almost to the time of his death in 1895, Riley showed an active interest in the few diseases of insects known at that time. In this connection he did three things of note: He chronicled some of the early observations being made in this country on the *Cordyceps* fungi of the so-called white grub (*Lachnosterna*). He provided a critical appraisal of the ill-fated attempts to use the so-called "yeast fungus" to control insect pests. (In this, his skepticism proved justified, inasmuch as the claims were made on entirely unsound and unscientific bases.). He organized laboratory and field tests of commercially prepared entomogenous fungi (*Beauveria*) produced in France,[2] showing in convincing fashion that, as Chief of the Division of Entomology, he was not to be caught napping on any new developments in economic entomology. His writings also show that he was not easily deceived or duped by extravagant claims, and that he consistently insisted upon concrete evidence and experimental proof. Had more investigators been as demanding, the utilization of microorganisms in the control of insects might have had a more propitious beginning.

Our understanding of the nature of disease in insects, the suppression of disease in beneficial insects, and the use of disease in the control of insect pests has assuredly come a long way since the day of Riley. Advances have been particularly rapid during the past decade or two. Today there is much to talk about in insect pathology;

[1] 1959 Memorial Lecture. Presented on November 30, 1959, at the meeting of the Entomological Society of America, Detroit, Michigan, November 30–December 3, 1959.

[2] To my knowledge, this preparation represents what was probably the first (1891) commercially available entomogenous microorganism sold for the purpose of controlling insects. The fungus was apparently a strain of *Beauveria tenella* (Delacroix) Siemaszko isolated from the cockchafer (*Melolontha*). It was manufactured by Fribourg & Hesse in Paris, and was offered for sale (6 francs) in the form of tubed cultures or as spores.

there will undoubtedly be more to talk about in the future. I could discharge my assignment here this morning by describing some of the recent advances in research in insect pathology and microbial control, or I could perhaps do it by philosophically analyzing the general progress that has been made and what the future might possibly hold. I have decided to resolve this difficult choice by attempting to do both, or at least some of each. And to aid in accomplishing this I shall divide my remarks into three parts: the Challenge, the Achievement, and the Promise. For insect pathology, at this particular time, these three rather general and platitudinous words have real significance and meaning.

The Challenge

Permit me to begin by briefly identifying for you what, in my opinion, is the challenge to be met by insect pathology. Actually, several challenges are involved; I should like here to mention five: First, there is the challenge to know more about the role of disease in insect life, the effect of disease on insect populations, the relationships between microorganisms and insects, and the nature of the pathogens themselves; in other words, we must learn more about the basic nature of insect diseases. We are inclined to overlook the fact that disease and death are ever-present phenomena in the life of insects, and therefore the challenge to gain a more perfect understanding of these phenomena offers a real invitation to penetrating research. Second, there is the challenge to understand more about the noninfectious maladies of insects, the diseases caused by abnormalities in nutrition, structure, physiology, and metabolism, and the pathological effects caused by chemicals, physical agents, and insect parasites and predators. Third, there is the challenge to learn how better to control and to suppress disease among insects beneficial to man—insects such as the silkworm, the honey bee, and certain insect parasites. Fourth, there is the challenge to learn how better to mass produce insect pathogens and to exploit the diseases they cause so that they may be employed directly for man's benefit, and be used readily to control insect pests as other microorganisms are utilized by man to accomplish other benefits. The essential theme here is that in the past man has had to concentrate on combating the activity of the relatively few microorganisms harmful to him. Now he is in a position to utilize those that can be beneficial to him. In much the same spirit with which the physicist and engineer strive to harness the atom, the entomologist (as others are doing in other fields) should strive to harness the microbe and to adapt it to his uses. And fifth, there is the challenge to apply the knowledge being gained from the study of diseases in insects to the study of diseases in man and in other animals, and to problems of biology generally. Especially do I wish to emphasize the role of insect pathology in serving as a model for the development of invertebrate pathology—a field of tremendous possibilities and one for which I have been enthusiastically advocating support for the past several years.

In citing these five arbitrary challenges I have tried to indicate an equitable balance between them. This does not necessarily represent the true state of affairs, and some entomologists are more interested in one or two of these than in the others. It is probably true that the greatest present-day interest centers on the role of disease in insect control, so that for many insect pathologists the greatest challenge is that of perfecting methods of using microorganisms in the control of insect pests. Particularly challenging is the problem of learning how best to introduce insect pathogens into pest populations and to establish them in order to obtain self-sustaining, prolonged, or more-or-less permanent control. And, of course, the intense interest in this application of insect pathology (i.e., in microbial control) is understandable. Each of us desires to have his efforts, as modest as they may be, serve mankind in some way or be of some eventual use to it. However, it is my conviction that even if there were not the slightest possibility of insect pathogens being used as agents of control in man's fight against his insect enemies, there would still be abundant justification for the formalized discipline known as insect pathology and for the study of insect disease. Merely to gain a better understanding of the role of disease in insect life, its natural occurrence in and its effect on insect populations, and the control of disease among beneficial insects or those reared for commercial and experimental uses is ample justification for any well-balanced department of entomology to have an insect pathologist on its staff. Basically, the principal challenge that insect pathology offers, as is true with most scientific disciplines, is the search for knowledge; the applications of this knowledge will follow as an extension of this challenge and with the proper wisdom and industriousness of the men who pursue it.

Having said this, it is only realistic to acknowledge that one of the outstanding challenges of insect pathology is, as I have indicated, its application in the control of harmful insects. I like to think of this particular challenge as an attempt by the entomologist to master the microbe as well as the insect—not just in the way the microbiologist masters microscopic life, but in a way peculiar to entomology. This is one reason why, in our educational program in insect pathology at the University of California, we attempt to train entomologists as well-rounded insect pathologists, not as insect virologists, or insect bacteriologists, and the like—but as entomologists who are as conversant with the microbe as they are with the insect. But, and this fact I would strongly emphasize, an entomologist does not have to be trained in insect pathology to use and appreciate the fruits of this discipline. This is becoming abundantly clear as the entomologist warms up to and becomes familiar with pertinent phases of microbiology as he has had to do with chemistry, physics, statistics, and other disciplines. And so, from the applied standpoint, one great challenge of insect pathology remains the entomologist's exploitation and harnessing of the microbe as a working tool to serve his purposes. Just as microorganisms are employed in the manufacture of dairy products and certain other foods, in the processing of certain materials for clothing, in the preparation of certain medicines and therapeutic agents, in manufacture of certain chemicals, in the fertilization of crops, and in numerous other ways, so it is that with the accumulation of sufficient knowledge the entomologist will meet the challenge of using microorganisms to control insects, and for other entomological purposes.

To many entomologists it might appear that insect pathology is something of an upstart in entomological science. For years we have had such disciplines as insect morphology, insect taxonomy, insect physiology, insect ecology, insect toxicology, and the rest. Now suddenly—or so it might seem—we have something called "insect pathology." From whence did it come? Does it really belong? What good is it? Departments and bureaus of entomology the world over have been functioning ably and nobly without insect pathology in their curricula or in their research programs, and without insect pathologists on their staffs. Now, since 1945, and especially during the past 5 or 6 years, many of the leading entomological institutions in this country have, by one means or another, included insect pathology in their program; some have added insect pathologists to their research staffs, and others contemplate doing so. This activity is taking place not only in this country and in Canada, but in France, Germany, England, Czechoslovakia, Russia, Australia, Japan, and elsewhere. Within the past year or two industry has been finding a need for insect pathologists, and with the commercial development of microbial insecticides the interest in industrial insect pathology has increased in most of the countries just named. Roughly estimated, throughout the world there are at least 250 professional scientists conducting research on the diseases of insects—with about 150 of these working on the diseases of destructive insects. And the number is increasing every year. In addition, many entomologists in other pursuits from time to time find themselves giving their attention to a problem in insect pathology. In making these statements, I wish to

point out that actually we have had insect pathologists in our midst for a long time, and therefore we really should not be considered such a strange breed of cats. I refer to those apiculturists and sericulturists who for many years have been concerned with the diseases of the honey bee and of the silkworm. (Recently, in launching the new *Journal of Insect Pathology*, it seemed somewhat meaningful to me that the very first manuscript we received was concerned with a disease of the honey bee.)

Does all this increased or renewed interest in the diseases of insects mean anything really significant? I think it does: among other things, it means that just as the plant scientist recognizes plant pathology, as the animal scientist recognizes vertebrate animal pathology, as the study of man recognizes the importance of his diseases, so the entomologist in general is, at long last, more fully recognizing the importance of knowing what can go wrong with the health of an insect. He is beginning to see clearly the wisdom in understanding the effects of disease on insect populations. Although for a long time he has concerned himself with the maladies of the silkworm and the honey bee, he now is anxious to know more about the diseases of other beneficial insects, and he finds it necessary to develop methods of controlling disease in insectaries and in laboratory colonies. And, finally, the entomologist recognizes the potentialities in using certain of the insect pathogens in the control of insect pests. Insect pathology is at an important and exciting period in its history!

Without question, insect pathology is a valuable and distinctly valid branch of entomology, and deserves to be accorded its place alongside the other branches of the science, not only in academic institutions but also in research organizations both governmental and industrial. As we have pointed out on a previous occasion, not only does insect pathology require the methods of, and information from, the microbiological sciences of pathology, bacteriology, mycology, virology, protozoology, nematology, and immunology, but also from almost every branch and section of entomology. But insect pathology is by no means parasitic on the other entomological disciplines; it has much to contribute to each of the various branches. I do not know of a single area of entomological activity where pathology cannot contribute to an enhancement of the understanding of that activity.

I think it helps one to appreciate the fundamental role of insect pathology in entomology if he keeps in mind that in its true essence, insect pathology concerns itself with whatever can go wrong or become abnormal in an insect. A diseased insect may be one suffering from an infectious disease, from a metabolic disturbance, from a nutritional deficiency, from a physical or chemical injury, or from injury caused by an insect parasite or a predator. And while I am not implying the usurpation of anyone's territory, it is only a matter of acknowledging basic facts to recognize that parasitism by microbe, worm, or insect constitutes disease; and that when one swats a fly, or poisons it with a chemical, or allows it to be attacked by a parasite or predator, pathology results.

In stating for you the challenges facing insect pathology, I am of course cognizant of the background against which these particular challenges are silhouetted. Along with all entomologists, the insect pathologist is participating in the great effort to produce enough food, fiber, and lumber to feed, clothe, and house the exploding world population. In the time that has elapsed since I began speaking, the world population has increased by approximately 1,800 people. A week from today there will be almost 1,000,000 more; a year from today about 45,000,000 more—a figure equal to the entire population of France, for example. When we consider the food, clothing, and housing that must be provided these and the millions of individuals now unborn, and the importance of insect damage in the production of these materials, we can appreciate the enormity of the challenge that faces entomology. And I submit that insect pathology constitutes an integral part of any entomological endeavor designed to meet this challenge.

Achievement

When we consider insect pathology's record of achievement, we must first of all recognize that although its main roots go back more than a century, it is (as we conceive of it today) an extremely young branch of entomology. So young, in fact, that it is perhaps presumptuous even to speak of its achievements in the sense of completed accomplishments. As a formal distinct discipline or organized branch of entomology, insect pathology is only a teenager not much more than 15 years old. Prior to this time the diseases of insects were usually studied either as curiosities by individual biologists in any of several disciplines, or seriously in separate and special projects, or confined to certain insects such as the silkworm, the honey bee, or the Japanese beetle. Nevertheless, the achievements accruing from the brief and modest beginning are impressive. It is not my intention here to review in detail the numerous and notable contributions insect pathologists have made, or to describe the accomplishments of insect pathology as a branch of entomology; this has been done elsewhere. Instead, permit me to itemize a few of the landmarks in what might be considered as the practical achievements of insect pathology. Then I should like to use one of these to exemplify the nature of research and development in insect pathology and microbial control.

Although the recorded history of insect pathology may be said to begin with Aristotle, and include the writings of poets and naturalists in the 16th, 17th, and 18th centuries, its debut as an appropriate study for entomologists, it seems to me, took place in 1826 when Kirby and Spence included a chapter titled "Diseases of Insects" in their famous work "An Introduction to Entomology." This chapter, written by William Kirby, was a remarkable presentation for that time. In spite of the general nature of this chapter, most of the attention then was devoted to the diseases of the silkworm. Our heritage from the work on the diseases of this insect is tremendous. Insect pathology as an experimental science had its beginning with the illustrious work of the Italian Agostino Bassi who, in 1834, for the first time showed experimentally that a microorganism (the fungus *Beauveria bassiana*) was the cause of an infectious disease in an animal (the silkworm). To some extent the importance of Bassi's contribution to insect pathology and to medical science was not fully appreciated until recent years, but it is now unquestioned. It must also be mentioned that in his writings we find the first suggestion —somewhat vague, to be sure, but nevertheless the idea was there—that microbial life be used to destroy harmful insects.

Our list of accomplishments should further include the renowned studies (1865–1870) of Louis Pasteur on the diseases of the silkworm and the methods he originated to save the silk industry of France from almost certain ruin; the first definite and clearly stated recommendation (by John L. LeConte in 1873) that the diseases of insects be studied to determine the most effective means of using them against noxious insects; the first significant experimental tests using a pathogen (the fungus *Metarrhizium anisopliae*) to control a harmful insect (the wheat cockchafer, *Anisoplia austriaca*), performed by Elie Metchnikoff in 1879 in Russia; large-scale attempts to use pathogens to control the chinch bug in the United States and grasshoppers in various parts of the world, in 1888 and 1912; and the brilliant contributions of G. F. White (1908–1920) toward clarifying the etiology and nature of the principal diseases of the honey bee.

It is said that one cannot safely evaluate the work of one's contemporaries, and I shall not try, but I think it is safe to say that any list of accomplishments in insect pathology should include such items as the elucidation of the milky diseases of the Japanese beetle by the scientists of the U. S. Department of Agriculture, and the use of these diseases in the control of this beetle; investigations (especially in Canada and in Europe) concerned with the virus diseases of certain forest insects, and their role in the natural control of these insects; similar studies in the

United States and abroad on the nature and use of virus diseases of field and truck crop insects; the revelation as to the basic nature of the insect viruses as accomplished during the past 12 years. And we could go on and on extending and filling in this list with numerous accomplishments all of which would leave no doubt in your minds that insect pathology is indeed an active and virile field, and that it has contributed heavily to our knowledge of insects themselves, their struggle for existence, the nature of their diseases, and the role of disease in suppressing populations of harmful insects both naturally and through the use of pathogens as employed by man.

At this point, I should like to discuss one development in insect pathology more fully, and to use it to indicate some of the lessons we must learn if we are to realize the full benefits of applied insect pathology. I am also choosing it because of the current and widespread interest in it not only on the part of insect pathologists but of entomologists generally. It has also become the concern of the insecticide industry. Moreover, and especially important, I think, it illustrates the internationalism of science, the importance of basic research, and the opportunities for the commercial development of biological control methods. I am referring to that fascinating insect pathogen, *Bacillus thuringiensis* Berliner, and its varieties. As most of you probably know, spore preparations of this bacterium are now being prepared for commercial use as a microbial insecticide in the control of a growing list of susceptible insects. During the past year or two, at least four companies have developed products for experimental use containing this bacillus as the active ingredient, and temporary exemptions from a tolerance have been granted by the Food and Drug Administration. The evidence is now convincing that in appropriate situations *Bacillus thuringiensis* is an effective control agent, especially against certain lepidopterous pests.

The history of this development spans the entire period from the present day back almost to the beginning of experimental research in insect pathology. The story begins in Europe during the last half of the 19th century, when the sericulturists of France and Italy found their silkworms dying of a malady they called *flacherie*. (A similar disease may have also been present at that time in silkworms reared in the Orient, but the records are not clear.) Although bacteria such as Joly's *Vibrio rugula* and *Vibrio agliae* were seen in diseased silkworms as early as 1858 and 1862, their relationship, if any, to flacherie is not known. Between 1865 and 1870, Louis Pasteur (who, incidentally, was a contemporary of Riley, both dying in the same year) made significant observations on the disease as he found it in silkworms being reared on farms in the Cévennes in southern France. He observed a sporeforming bacterium which he believed to be the cause of flacherie. Some authorities believe that Pasteur was actually concerned with two different species of bacteria, one of which was probably a variety of *Bacillus thuringiensis*. At any rate, he found that dust from menageries in which silkworms had sickened and died of flacherie was capable, when fed to healthy larvae, of bringing on the malady in a few hours. Such larvae did not, at first, contain the significant numbers of bacteria in their bodies that would have been found had they died of a typical bacterial septicemia. Instead, it appears that they exhibited a toxemia and paralysis of the type now known to be caused by *B. thuringiensis* and its varieties. The menagerie dust contained something that brought about the symptoms of the disease which, at other times, appeared to be associated with certain sporeforming bacteria.

The scene now shifts to the Orient where, in 1902, a Japanese scientist by the name of Ishiwata isolated a sporeforming bacterium which he designated as the "sotto bacillus"; "sotto," in Japanese, meaning "sudden collapse" —a pithy description of the paralysis and sudden death Ishiwata observed to occur in infected silkworms. Four years later Ishiwata further observed that while fresh cultures of the bacillus were not particularly pathogenic, cultures 7 days to 9 months old were highly lethal to insects. He also recorded the fact that although these old cultures were toxic, filtrates of them were not.

Then, in 1915, two other Japanese workers, Kaoru Aoki and Yoshika Chigasaki, became interested in whether the action of the bacterium, which they called *Bacillus sotto*, was through its invasion and multiplication, or through the activity of toxins produced by it. They maintained that the lethal effect had no direct relation to the increase of bacteria in the intestine of the silkworm, but that the insects died from the effects of a substance present in old agar cultures. In other words, Aoki and Chigasaki confirmed the fact that a very lethal toxic substance was associated with this bacillus which caused a type of flacherie in insects. But the mystery of why this toxic property manifested itself in only older sporulated cultures was not clarified. The entire phenomenon was quite different from that associated with most other pathogenic bacteria.

About this same time some interesting observations were being made in Germany by a scientist appropriately, for that country, named Ernst Berliner. In 1909, in a flour mill in Thuringia, in central Germany, larvae of the Mediterranean flour moth, *Anagasta kühniella* (Zeller), were found dying of a bacterial disease. Berliner studied the malady, reporting on it in 1911 and 1915, and to the causative bacterium he gave the name *Bacillus thuringiensis*. (Eventually it was to be shown that this bacillus described by Berliner is closely related to *B. sotto*. However, since *B. thuringiensis* was properly named prior to *B. sotto*, the latter is considered a variety of *B. thuringiensis* rather than the other way around.) He found the bacillus to be highly virulent for flour-moth larvae, and speculated as to its possible use in the control of this insect. Again, however, the toxic properties of this fast-killing pathogen were not revealed. But Berliner did record, entirely incidentally, one bit of information that would have been a clue to the answer had it been realized. He noticed that during the process of sporulation, the vegetative remains of the cells assumed a peculiar rhomboid shape.

Twelve years passed. Then, in 1927, another German worker, Otto Mattes, reisolated *Bacillus thuringiensis*, and in reporting the results of his cytological observations illustrated this rhomboid body (which he called a "Restkörper") and gave a brief description of it. However, neither Berliner nor Mattes attributed to this parasporal body any role in the disease.

Although the nature of the bacillus's lethal action remained obscure, adventuresome entomologists began to give the pathogen a try as a control agent. In the late 1920s and the 1930s encouraging results were obtained in Yugoslavia, Hungary, and elsewhere, using *Bacillus thuringiensis*, as well as certain other sporeforming bacteria, in attempts to control the European corn borer, the gypsy moth, the pink bollworm, certain pests of grapes, and other insects. Regrettably, when World War II broke out in 1939 most of this work (conducted primarily by Husz of Hungary and by Metalnikoff and co-workers of the Pasteur Institute in Paris) had to be abandoned.

Fortunately, in 1936, J. R. Porter, an American bacteriologist, obtained from Mattes, in Germany, a culture of *Bacillus thuringiensis*. Porter, in turn, gave a transfer of it to Nathan R. Smith who was then engaged in a taxonomic study of the genus *Bacillus*. Then, in 1942, Dr. Smith kindly sent me a transfer which I dutifully but routinely stored in the refrigerator. There, with periodic transfers, it stayed, respected largely because of its historical interest, until 1949. At that time, (and as we had been since 1944), we were engaged in a study of a polyhedrosis virus of the alfalfa caterpillar, *Colias philodice eurytheme* Bdv., and, together with my colleague C. G. Thompson, in its use in the control of this insect. Although the virus was, and is, an effective control agent, it requires a 5- to 10-day incubation period before it destroys its host or causes the latter to stop feeding. In many instances this disadvantage can be adjusted for in actual control practices, but in other situations it would be distinctly de-

sirable to use a pathogen having a shorter incubation period.

Inasmuch as bacterial pathogens usually have relatively short incubation periods, it was perhaps only natural that our thinking should turn to a reconsideration of these microorganisms. One frustrating day I happened to remember the culture of *Bacillus thuringiensis* we had been holding in the refrigerator the past seven years—i.e., since 1942. However, because this strain had originally been isolated in 1927 and had been maintained on artificial media since then, it seemed unreasonable to expect that it could still be pathogenic after all this time. Nevertheless, it was worth a try. You can imagine our surprise when it turned out that the bacillus was still highly virulent. Indeed, it was so hard to believe that I expressed the suspicion that someone had sabotaged the experiment with a chemical insecticide! But repetition of the experiment gave consistently spectacular results provided—and this was important—provided we used cultures that had already sporulated. Fresh vegetative cultures gave disappointing results. We, of course, accepted this peculiarity of the bacillus and proceeded with field tests and susceptibility tests in other insects using well-sporulated preparations. It soon became clear that *B. thuringiensis* had all the potentialities of an effective microbial insecticide, and that its proper use could effectively control destructive populations of a susceptible insect. As produced in insects making up field populations, the disease exhibited the same symptoms of toxemia and paralysis we had observed in the laboratory.

Meanwhile, in France, Toumanoff and Vago isolated a sporeforming bacterium responsible for enzootic flacherie in silkworms in the Cévenole region of France—the same area where Pasteur had studied flacherie some 80 years previously, and the place we arbitrarily began our story. Toumanoff and Vago believed their bacterium to be one of those Pasteur had observed during his work on the disease. They considered it to be a variety of the common *Bacillus cereus* Frankland and Frankland, and gave it the name *Bacillus cereus* var. *alesti*. It was eventually shown to be closely related to *Bacillus thuringiensis* and is now considered by many to be a variety of the latter. The French workers noticed that, as with the other strains of *B. thuringiensis*, their bacterium possessed marked toxic properties for the silkworm.

While our attention was centered on aspects of host susceptibility and control, our colleagues in Canada initiated basic studies into the nature of the bacillus and its pathogenic properties. Dr. T. A. Angus at the Insect Pathology Research Institute in Sault Ste. Marie concerned himself primarily with the toxic properties of *B. sotto*, while Dr. C. L. Hannay at the Science Service Laboratory in London, Ontario, studied the nature of spore and crystal formation in the Mattes and other strains of *B. thuringiensis*. Drs. P. C. Fitz-James and I. E. Young at the Univ. of Western Ontario, have been concerned with crystal formation as a system for the study of protein synthesis. I have mentioned that rhomboid parasporal bodies had been seen in the sporangia of *B. thuringiensis* by Berliner and by Mattes. However, the description by Hannay, in 1953, of "crystalline inclusions" in the sporangium focused new attention on the bodies. Particularly important, however, was Hannay's speculation that these inclusions were associated with the pathogenicity of the bacillus. In the meantime, Angus was clarifying the toxic nature of *B. sotto* for silkworms and relating Hannay's study of the crystals to the symptoms of paralysis evident in insects to which spore-crystal preparations had been fed. Subsequently, in our own laboratory, we studied this relationship with several additional new strains and species of these crystalliferous bacteria, as they are called, and observed interesting variations in the morphology of the crystals. A. M. Heimpel and Angus utilized the toxic properties of these strains and species in revising the taxonomic status of the crystalliferous sporeforming bacteria, establishing new species and making *sotto* and *alesti* varieties of *B. thuringiensis*. These two workers have also revealed that, depending on the insect species, at least three different modes of action are involved in the pathogenic action of crystalliferous bacteria upon insects, and in at least two of these the crystallized toxin plays a dominant role.

Thus, some of the early mysteries concerning these interesting insect pathogens are becoming clarified. We know now, for example, that a great part of the highly lethal and toxic nature of these bacteria is related to a toxic crystal formed at the time of sporulation and held in the sporangium until the bacterial cell wall disintegrates liberating the spore and the crystal. This explains why the toxic nature of the bacillus did not manifest itself in young cultures but only in older cultures—cultures that had sporulated.

My use of a part of the story of *Bacillus thuringiensis* as an example of one of the accomplishments of insect pathology was purely arbitrary. Any number of other examples could have been used. And what I have told you is admittedly cursory and incomplete, necessarily omitting contributions of many. The story is far from finished, and there is still a great deal about this bacillus and its toxic crystal that we do not know. But I believe I have told you enough to enable me to make several points in this connection. These are:

First of all, I believe that the example I have used illustrates the fact that insect pathology, like other branches of entomology, is dependent upon international science and upon the free interchange of ideas within the international scientific community. We can take justifiable pride in what the entomologists of our individual countries have contributed, but this pride must be tempered with a fuller appreciation of what our colleagues abroad are thinking and doing. This joint meeting of the Entomological Society of America and our sister Societies of Canada is an appropriate occasion, it seems to me, to call attention to the fine bond of friendship and cooperation existing between our two countries in insect pathology. Not only is this exemplified by the work with the crystalliferous bacteria, but by numerous other projects and advances in insect pathology. The government of Canada has probably put more effort and funds into basic insect pathology than the government of any other country. I would be seriously remiss if, on this occasion, I did not acknowledge and hail their important contribution to the development and advancement of insect pathology.

In the second place, I believe that the *Bacillus thuringiensis* story illustrates the advantages that come from working in an area common to different scientific disciplines. This is, of course, true in other areas of entomological research where, for example, combinations of entomology and chemistry and entomology and physics have accomplished so much. The wedding of the entomological and the microbiological sciences is a natural one—a shotgun is no longer needed to convince us that the union of the two is an honorable and proper one. Nor is the intermingling of fields something we should merely tolerate; rather it is something we should promote. Such cross-fertilization between disciplines can give us hybrid vigor of the most productive and worthwhile type.

Thirdly, I believe there is a place in all this for a note of genuine humility. I have frequently said that our Laboratory has received far more than its share of credit in the development of crystalliferous bacteria as microbial insecticides. This is said as no idle platitude. Rather, it springs from the conviction that all of us owe so much to those who have preceeded us, to those who have taught and inspired us, to our contemporaries in other laboratories and other countries, and to our close associates, that to assume our own contributions paramount is not only ungracious, but lacking in objectivity and scientific realism. I think the *Bacillus thuringiensis* story illustrates this well. Prior to the initiation of our own work on this insect pathogen in 1949, no less than 15 scientists had worked on it or its varieties; since then the number seriously concerned with research on it approximates 50.

This may sound like very few scientists, but the number is highly significant, it seems to me, in so small a field and so limited a subject as this one.

And fourthly, I must make the point, no doubt an obvious one, that what is now a commercial reality in the form of a microbial insecticide, did not become this way overnight. Years of basic research preceeded and accompanied the practical utilization of *B. thuringiensis*. We should not be allowed to forget that these rewards arise out of the curiosity of the mind of man and his desire to seek knowledge for knowledge's sake. I am well aware that we are being preached at from many sides on this point, but like all truths, repetition ensures conviction and dedication to principle, and certainly this is one principle which deserves all the dedication we can give it. But there is another side to this coin. Sometimes, after the basic discoveries have been made, there is an unnecessary lag before the fruits of fundamental research are picked. To some extent this was the case with *Bacillus thuringiensis* which undoubtedly could have been developed commercially and used as an insecticide long before now. However, it appears that until recently, the "time was not ripe." Answers, at least partial answers, to many of our questions can be found all about us, but in so many instances we do not seem to be asking the right questions at the right time.

Promise

I have one more point to make in connection with the development of *Bacillus thuringiensis* as a microbial insecticide, and I should like to use it to introduce the final part of my talk, namely the Promise. They say that only a fool will predict the future, and since I do not wish to emphasize my status in this category, I shall certainly avoid any pretense of being a prophet as far as insect pathology is concerned. On the other hand, part of the fun or enthusiasm we feel in working in our different fields, indeed part of the fun we have in living, has to do with what we can see and imagine as being in the future, and in speculating about it. So in this spirit, permit me to voice a few general opinions about certain aspects of the relatively near future of insect pathology and microbial control. I am sure that any of you who have read recent books like Jean Rostand's "Can Man Be Modified," which predicts man's biological future, will undoubtedly find any forecasts I am likely to make to be pablum soft, quite harmless, and unexciting.

But back again, for just a moment, to *Bacillus thuringiensis*. I said that the story on this development was far from finished. To be sure, it appears that we now have enough information and know-how to safely and effectively use the bacillus and its varieties as microbial control agents, and studies along these lines are continuing in our laboratory as well as in others, both in this country and in Europe. Commercial products containing these crystalliferous organisms are being developed, tested and, we hope, perfected. But I should like to call attention to the fact that in the midst of this accomplishment lies another, perhaps even greater, challenge and another promise.

Some of our friends working with chemical insecticides have made it a point to remind us that, after all, this toxic crystal produced by *B. thuringiensis* is a chemical substance acting in a manner analogous to a stomach poison. Of course, they are essentially correct. And, while it is not unusual for microorganisms to bring about their toxic or pathogenic effects through the production of toxins of different sorts, there is no denying that the pathologic *modus operandi* of *B. thuringiensis* is somewhat unusual among insect pathogens. But I should like here and now to throw to my chemist friends a challenge which I hope they will accept. It appears to me that here nature is providing those of you in chemistry an opportunity to unlock the door to a group of truly remarkable insecticides, insecticides that are highly lethal for certain insect pests but essentially harmless for every other type of life. Here in this crystal is a substance that, as far as we know, can (in amounts adequate for most insecticidal purposes) be used without worrying about a highly toxic residue, or seriously harmful effects on animals or plants. We know very little of the chemical properties of this crystal other than it is a relatively stable proteinaceous substance, probably a polypeptid, soluble in dilute alkali, containing at least 17 alpha-amino acids, 17 per cent nitrogen, and no phosphorous. To be sure, some work is being accomplished along this line, but there is room for much more. I submit, therefore, that if you in chemistry and toxicology will learn the intimate nature of this material you might introduce us to a whole new group of natural or synthetic substances having ideal insecticidal properties. Perhaps I should not use the word "if" in this connection, because undoubtedly it will be done eventually. Instead, permit me to offer it as one of the promises of insect pathology.

I dare go further. It is my conviction that we have only begun to exploit entomogenous microorganisms *and their products*. And, unless I am looking through a distorted crystal ball, I foresee increased collaboration between the chemist and the physicist on the one hand, and the insect pathologist on the other. There is evidence that entomogenous fungi, as well as bacteria, are capable of producing substances—toxins and antibiotics—that are lethal for insects. To realize the utility and benefits of these substances there needs to be a new rapprochement in entomology between the chemist and the biologist, between the so-called chemical control man and the biological control man. We are beginning to see some evidence of this union in control work in the field, such as the advances being made in what my colleagues in California are calling "integrated control." The importance of this development cannot be overemphasized, and the integrated control concept deserves to be fostered on an ever-widening scale. I only wish here to plead that this concept be brought into the laboratory as well. The biologist and the chemist should be brought more closely together on a basic research level, in the laboratory, in the field, in theoretical considerations, in thought and in action.

My predecessor in this series of lectures took a valid position in considering how insects achieve "better things for better living through chemistry." I would only caution that by no means all of this better living, or all of biology, or all that is known of insects, or all of our pest control practices, can be reduced to pure chemistry as such. I imagine that every student of biology has had it drilled into him how dependent he is on an understanding of chemistry and physics. None of us needs to be convinced of the basic importance of these sciences. As Wigglesworth correctly asks concerning the living cell, "May we not regard it as a chemical organism?" However, as is being evidenced in entomology and other fields, the pendulum is beginning to return to a position where biology as such is becoming a most important concern of science and society, and where the chemist and the physicist find that they must also have an ever-greater understanding of biology. Certainly there is now less excuse for the snobbish peck order of the sciences where the mathematician looks down on the physicist, the physicist on the chemist, the chemist on the biologist, and the biologist on the psychologist. Organismic biologists are telling us that biology is an autonomous discipline with concepts and laws peculiar to itself, and that the physicist, chemist, and mathematician would do well to recognize and appreciate this fact. The bedrock of entomology is life science and we court disaster if we sell its birthright to other disciplines however much they may be needed to understand and implement the control of insects. Neither the chemist nor the biologist can satisfactorily travel the road alone; in all truth, the chemist and the biologist—together—do have new entomological worlds to conquer.

May I finish the point I am trying to make here by taking the liberty to suggest that the chemical insecticide industry (or the fermentation or biologics industries, as the case may be), in addition to exploiting the use of microorganisms and their products, broaden their perspectives even more and engage in and support active research on biological insecticides of all types. Not, of course, at the expense of developing more and better chemical

insecticides, but in addition to it. I realize that, to a certain extent, some are already doing this, but I believe the point could stand emphasis. I am referring to the future of and the potentialities inherent in such recent developments as the attracting, trapping, and killing of harmful insects through the use of sex attractants, the use of blue-green algae and of such biological substances as iridomyrmecin which has been recently synthesized, the destructive capacity of the juvenile and other hormones, the use of the secretions of the repugnatorial glands of insects, the disruption of insect-symbiote relationships through the use of antibiotics, and the use of certain fermentation products, anti-feeding compounds, and growth regulators. There will, of course, be problems, risks, and difficulties involved in perfecting any of these for insect control, but this is to be expected. No one would advocate taking unnecessary risks, but one hopes that the temper of American Industry and Science is such that it would be out of character for them to meet the challenges offered in any but a daring and adventuresome manner. There is no room in science—pure or applied—for men of little faith! All of these developments, it seems to me, emphasize the growing need for closer cooperation between the biologist and the chemist, between biological control and chemical control, between the biological way of thinking and the chemical way of thinking. No longer can entomologists afford to work in hermetically sealed compartments; each of our specialties must merge imperceptibly into other specialties and into other sciences.

Let us continue more directly with the matter of what the future holds for insect pathology and, more important, what promise insect pathology holds for the future. Inasmuch as time does not permit me to indulge in detailing the remarks I should like to make in this connection, I shall merely summarize some of what, to my mind, this promise might be, recognizing throughout that some people have an aversion to the use of the word "promise" in this connection, and that we may not always agree in our definition of the word.

First of all, in light of what I have been saying, I am confident that in the future we shall see a more effective balance between biological and chemical methods of control. Fanaticism in both camps will subside, and a joining of forces will be a common method of operation. Just as many chemical insecticide companies and entomologists now look upon microbial insecticides as allies rather than competitors, so will the more progressive ones explore and promote other biological methods, even to the production and distribution of certain parasites and predators. (The unfortunate current slogan of one insecticide company, "the only good bug is a dead bug" will not only be scientifically inaccurate, which of course it is now, but distinctly passé). While this is being done, of course, the insect pathologist will also be attempting, as part of his assignment, to study and develop microbial control agents, as such. Especially should he be concerned with long-range control that might follow the introduction and establishment of pathogens in insect populations.

As far as future microbial insecticides are concerned, it is difficult to predict, but that there will be more of them there can be no doubt. Not all will come as easily as *Bacillus popilliae*, or as *Bacillus thuringiensis* with its built-in poisonous toxin. But pathogens kill their hosts by a number of different methods and as we learn to understand these methods we should, in many instances, be able to adapt them to our needs. There will be disappointments, of course, and we should not expect the impossible. My associates, on occasion, jest with me because I have rather frequently used the phrase that insect pathogens offer no panacea to insect control. The phrase may be trite but its truth is still a friendly word of caution to the overenthusiast. The statement of this truth, however, in no way detracts from the conviction I share with many of my colleagues to the effect that microbial control deserves and will have its place in man's battle against his insect enemies. While it offers no pie-in-the-sky solution to all our problems, it does offer a solution to some of them. A hurried listing of the known insect pathogens reveals that there are at least 80 species of bacteria, 215 species of viruses, 460 species of fungi (not counting the more than 1250 species of the integument-infecting Laboulbeniales), 250 species of protozoa, and 100 species of nematodes (not counting the large number of commensals and semiparasites)—all of which are capable of killing their insect hosts. Inasmuch as these more than 1100 pathogens represent only a very small proportion of those which must surely exist, the inherent potentialities are certainly impressive even though only a small proportion of these organisms turn out to be adaptable to use as control agents. In any case, entomologists have only begun to utilize the microorganisms associated with insects. Microbial life is a dynamic force to be suppressed, encouraged, or ignored by man. Our present mastery of the microbial life associated with insects is, in reality, quite feeble and inexpert. Years of basic research still stand between us and the full and ready use of insect pathogens to control insects. But we can, I am sure, look forward quite confidently to better days—to a "brave new world" in which insect-microbe relationships are more clearly understood and more fully exploited.

In my list of "prediction of things to come" I would certainly heavily underscore the promise that is on the horizon for the use of insect viruses in the control of certain insect pests. Bacteria and fungi have been the first to be available in commercial quantities largely because of the relative ease with which they can be mass-produced. But the time will assuredly come when the same can be done with the viruses and the protozoa which require living cells for their growth and development. Perhaps this accomplishment will come through the perfection of tissue-culture methods. In the meantime, field collections of diseased insects and insectary production methods can and should be used. Many of the insect viruses are highly pathogenic for their hosts, easily applied, and remarkably durable. One does not risk much in predicting their effective use as control agents. To hasten this development it is hoped that Industry will consider as one of its research obligations, the development of mass-production methods, not only of entomogenous bacteria and fungi, but of the more difficult-to-produce viruses and protozoa as well. Moreover, the insect viruses, while potent pathogens, inherently are probably even safer to man, animals, and plants than bacteria and fungi.

The tendency to discount the practical use of entomogenous fungi in insect control is not because they do not offer promise. Rather it is because we are grossly ignorant of how to use them. There is an urgent need here for technological know-how. One difficulty is that in order to infect insects, fungi require an abundance of atmospheric moisture. Under suitable conditions in nature, entomogenous fungi have been observed to exert rapid and impressive control of destructive insects. As yet, with certain exceptions, man has not learned how to duplicate nature in as thorough a fashion and at will. But that one day he will accomplish this I have no doubt. By taking advantage of favorable microclimates, by learning to control atmospheric moisture or moisture at the pathogen's point of contact, and by learning to mass produce resistant stages of these organisms we shall take our first steps toward mastering their use. Then too, as I said earlier, it is likely that a significant number of entomogenous fungi are capable of producing insecticidal substances that one day may be used directly against noxious insects.

The potentialities with regard to the use of entomophilic protozoa have not been realized but certain groups of them (e.g., the Microsporidia) include pathogens of distinct possibilities as control agents. As with the viruses, however, we are handicapped by the lack of adequate methods of mass production.

While some tantalizing starts have been made in the use of nematodes in the control of insects, this is still largely an unexplored field but one with vast potentialities. Hundreds, perhaps thousands, of nematodes are known to infect insects, many of them regularly killing their hosts. When we can solve the problem of mass production, and that of getting these highly pathogenic nematodes to their

hosts, we shall almost certainly have another effective weapon in our arsenal of insect control.

It is not difficult to foresee considerable progress in combining microbial control methods with other methods of control. In some instances microbial pathogens will be applied along with insect parasites and predators, or different strains and species of pathogens may be combined to form polyvalent microbial insecticides; in still other instances they will be applied along with chemical insecticides. Diseases will be employed to enable the grower to use lower dosages of highly toxic chemicals, and in some cases they may find use in synergistic combination with chemical insecticides. Such combined usages should not, of course, detract from the continued development and use of microbial control methods alone. Because, in general, insect diseases are harmless for other forms of life, they will (as they now do) find special use in situations where toxic chemicals cannot be applied. They will find use not only as manufactured insecticides, but as suppressive agents introduced into pest populations where they may take their place as natural control factors. As such they will find use in those areas of the world where the use of manufactured chemical or microbial insecticides is prohibitive because of costs.

As man's knowledge of microbial genetics and cellular physiology is enhanced, it is a virtual certainty that the time will come when the basic nature of microorganisms (as well as of parasites and predators) can be manipulated so as to enable us to design biological control agents to suit our needs. In a sense, it will be possible for us to "synthesize" insect pathogens with certain desired properties in a manner roughly analogous to that now employed by the organic chemist. Through the use of mutagenic agents it will be possible intentionally to modify a microbe's pathogenicity, durability, selectivity, and other properties so as to adapt it to our purposes and needs. We shall be able to produce artificial mutations creating new strains and varieties of pathogens that the entomologist will employ in his fight against harmful insects.

It is important to remember that microorganisms pathogenic for insects not only offer promise in the form of commercially prepared insecticides that are applied in the manner of chemical insecticides, but that pathogens may also be used as introduced agents of biological control in much the same manner as insect predators and parasites are introduced. Although there have already been successes in this procedure, we really do not know a great deal about the principles involved or how best to accomplish the desired results. It is to be expected that this area of microbial control will find increased study and practical accomplishment in the years ahead.

Indeed, in spite of the apparent success and promising future of "microbial insecticides" it is likely that the most enduring advances in microbial control will be accomplished with those procedures in which the pathogen may be *introduced* as a natural control factor. The discovery and use of chemicals and physical agents nontoxic for man, animals, and plants will undoubtedly be greatly extended in the future, lessening somewhat the present nontoxic advantage held by microbial insecticides. But the use of introduced pathogens into populations of insect pests for the purpose of establishing prolonged, or even "permanent", control will gain in its importance and in its applicability. Situations will vary so that pathogens will find applicability over a full range from repeated, temporary or short-term applications, to more prolonged effectiveness requiring repeated introduction, to instances in which a single well-established introduction will give indefinite control. Microbial insecticides are of considerable current interest and importance, but the introduction of insect pathogens as regulators of pest populations may have a much more illustrious future. Commercial interests may wince at this idea, but I see no reason why pathogens cannot be marketed for introduction purposes in a manner somewhat similar to that in which pharmaceutical houses market vaccines that provide long-term immunity to individuals receiving them.

The mere fact that I have been speaking primarily of those possibilities and promises of insect pathology that lie in the practical or applied areas of the discipline does not for a moment mean that major advances will not be made in other areas, such as that of basic research itself. Indeed, I believe that some of the principal advances of insect pathology will be made in this latter realm, eventually finding their applications in areas of entomology having little to do directly with the control of pest insects. They will also find application or significance in other branches of biology, agriculture, and medicine; certainly they will add immeasurably to our knowledge of microbial life and the process of disease in invertebrates. As far as insects are concerned, I believe that one of the major advances we shall see in the future will be a greater understanding of the epizootiology of insect diseases, and the effect of disease on insect populations. Much needs to be accomplished in this fascinating branch of ecological science. Our knowledge of the diseases of beneficial insects, particularly parasites and predators, is due for substantial advancements, with the idea of preventing and controlling the diseases (as has been done in the case of the honey bee and silkworm), thus supplanting the idea of using the diseases to control the insects. A constant by-product of research in insect pathology is the interesting new findings relating to the physiology and internal morphology of insects, and the contributions along these lines may be expected to continue. The varied relationships between insects and microorganisms in general (i.e., mutualists, commensals, as well as pathogens) all hold promise of great discoveries. The combining of microbiology and entomology has taken place largely in the realms of medical entomology and insect pathology, but the range of insect-microbe associations is even wider. The utter dependence of insects, in many cases, upon microbial life merely emphasizes how much there is to learn and how much promise lies in this realm of Nature's wonders, this realm where insect and microbe meet.

Again, I should like to emphasize that of the several ideas I have tried to advance here today, I consider none more important than my insistence that insect pathology has much more to offer than its contributions through microbial control, as important as that application is. I emphatically deplore and protest the tendency in some quarters to equate insect pathology with microbial control. Certainly, in the minds of entomologists, insect pathology should not be permitted to rise and fall on the success or failure of microbial control methods. This realization of practical benefits in the control of insect pests is all to the good and should be promoted, but it would be a tragic mistake to allow it, in Gargantuan fashion, to roll over and submerge the other benefits and contributions insect pathology has to offer. On occasions in the past, insect pathology has been ignominiously hung (but fortunately not executed) on the scaffold of its misapplications—let us hope it will not happen again.

One could, of course, go on citing possible future trends and accomplishments likely to occur along with the further development and maturation of insect pathology. I am sure that each of you, regardless of your branch of entomology, could do the same for your field of major interest. One need not plumb any great depth of profundity in order to make predictions so that a reasonable number of them will come true. It takes a certain amount of presumption to assume the role of a prophet, and in doing so one should not take himself or his predictions too seriously. Be this as it may, it appears that insect pathology, at long last, is here to stay, and those of us who find ourselves engaged in its study should feel fortunate that through it we can serve so fascinating and important a branch of science as entomology. And as far as the future is concerned, we know that the most exciting discoveries will be those we do not expect, and therefore cannot predict. But I feel certain that our confidence in the important and beneficent role of insect pathology in the future of entomology is in accordance with the grand sweep of entomological endeavor as envisioned by Charles Valentine Riley, whose memory we honor here today.

The Responsibilities of the Insect Taxonomist[1]

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I was warned that it would be a difficult assignment to follow the preceding speaker, and after hearing his stimulating presentation I am sure this warning was merited. However, in addressing an audience of entomologists, the majority of whom are not taxonomists, I have at least the inward satisfaction of feeling that however little I know of taxonomy a part of my audience will think that I know more than they do. In my limited experience, this is rarely the situation when an economic entomologist addresses the Eastern Branch of the Entomological Society of America.

I should, I think, first of all state my prejudices and position in the field of entomology, so that in the statements I make later you will be able to treat them with the proper bias. I am a taxonomist and a teacher and naturally I feel taxonomy to be an important area of study and investigation. To me taxonomy is indeed the queen of the sciences, drawing from the accumulated knowledge of all other fields whose importance is surely as great, but whose scope may be less extensive. Also, I am not here to defend taxonomy or make any special plea for her needs, nor really to apologize for her shortcomings. If this audience does not already understand at least some of the importance of taxonomy, it never will, and I would waste both my time and yours attempting to establish it.

I have been asked to discuss the responsibilities of the taxonomic entomologist to the related fields of entomology. This is scarcely a thirty minute assignment and I interpret my duty as not only to define what these responsibilities are but also to try to see how well they are being met and, if there are shortcomings, to try to isolate these and make a few suggestions for possible improvements.

The first part of the assignment is simple enough. The responsibilities of the insect taxonomist are: (1) to construct an orderly, intelligent classification system for all of the *kinds* of insects in the world and to understand the relationships to one another of these various kinds; (2) to establish a coding system for these insects so that they can readily be identified by any intelligent person, and so that their names will attain the greatest stability possible in a developing science.

The ideal that each serious taxonomist wistfully wishes for is to know so much about each insect species and infraspecific taxon in his study group, that in making decisions he can call upon the data of zoogeography, genetics, ecology, ethology, paleontology and chemistry to the same degree that he traditionally and necessarily utilizes the tools of comparative morphology. Were I to really attempt to analyse here how close the average taxonomist comes to this ideal, I am certain you would be convinced that I had surely come to bury Caesar, beyond doubt not to praise him.

How well is taxonomy doing the job? How carefully and methodically are we moving toward the ideal? In my humble opinion, we are doing a miserable job! You must understand that I am not complaining here of the high quality of work being done by many present day taxonomists, but rather attempting to evaluate the position of the science as such in meeting its responsibilities.

If taxonomy is doing a less than outstanding job (I believe I used the word miserable), why is this so? The shortcomings can, I think, be readily placed in three groups, to wit: (1) shortcomings of the taxonomist himself; (2) shortcomings of the society in general; (3) shortcomings of the entomological profession *per se*.

Let us look for a few moments at some of the shortcomings of the taxonomist himself. The first of these would be the prevalence of dilettantism among taxonomists. In no other modern scientific discipline is the fiddling around quite so obvious as in taxonomy. Some people in the field are essentially juvenile stamp collectors whose greatest delight is in filling in holes in their collection and corresponding over their treasures. There is indeed nothing wrong with this as such. I enjoy doing all of these things very much. The objection I raise is that it becomes confused with taxonomy by people who would be insulted if they were accused of confusing geologists with collectors of pretty beach pebbles.

Another and perhaps more serious aspect of this dilettantism, is the excessive individualism found in taxonomy, the incredible fact that invaluable type specimens (the bureau of standards of entomology, our veritable platinum rods) can be retained in private hands to be exposed to view only at the all too frequently erratic caprice of a single individual. These pack-rat tendencies of many modern workers and even museum curators, the almost complete lack of cooperative efforts with related disciplines etc., etc. are all failures that can be laid largely at the feet of the taxonomists themselves.

The taxonomist often complains bitterly of the lack of understanding he receives from his fellow entomologists, yet the university teacher of taxonomy probably gives less information on how his discipline really operates than any other part of the profession. I firmly believe that in most entomology departments the science of taxonomy is taught about as poorly as one can possibly imagine. This is not always because the taxonomist is a poor teacher, indeed he is often a very good one, but because there is a general confusion in entomology that equates taxonomy with identification. Until the teacher of taxonomy himself realizes that teaching students to identify insects is not teaching them the field of taxonomy, he will continue to produce entomologists who really know nothing about the field and he will continue to feel misunderstood and abused.

All of which points to the next problem of the taxonomist—his defensive attitude. Taxonomy, being perhaps the oldest scientific discipline, seems in this country to look with suspicion upon other disciplines because they are able to tap relatively large sources of public and private revenue. Man of course is just the kind of beast he is, and the superficial of the scientific community will always chase every new rainbow. This is, I think, all to the good in the long run. The taxonomist need not feel defensive because he achieves few "break-throughs", because his work blows up nothing, poisons nothing, sterilizes nothing and rarely burns up anything but his colleagues. If he cannot see the basic value of, and need for, the work he does he should be doing something else anyway.

The erratic training of many taxonomists is another major shortcoming in allowing him to meet his responsibilities. In most fields the writing of a fool or a scoundrel can be ignored, forgotten, or mildly chuckled over, but in systematics, with its high degree of subjectivity, its hegemony of rules and regulations, the fool can do serious damage and cannot, in fact, be safely ignored. The training, then, is of enormous importance. Yet, I have never seen a curriculum suggested for the prospective taxonomist, nor really any serious thought given as to what is of most importance for a common fund of knowledge that all working systematists should have.

[1] An address given at the 1959 meeting of the Eastern Branch of the Entomological Society of America, Atlantic City, N. J., Oct. 30.

A final "shortcoming" of many taxonomists today is their flirtation with the "new systematics" without a mature understanding of the limitations and qualifications under which this system works. The chief messiah of the "new systematics" has been the ornithologist Ernst Mayr, and his stimulating synthesis of the work of Rensh and others reinforced by his own bird work, has had a very great and important influence on all branches of systematics. The entomologist would do well to remember, however, that nearly as many people have worked on 8,000 species of birds as have worked on 800,000 species of insects before he jumps on this particular bandwagon. He would do well indeed to study the evolution of systematic *knowledge* in a group and be careful he does not equate the "new systematics" with a "better systematics". He might on a particularly sour morning contemplate whether the "new systematics" is really taxonomy at all or merely a watered down version of population genetics.

The problems curtailing the efficiency and dispatch with which the taxonomist meets his responsibilities that are attributable to his society in general I will mention very briefly as you are probably all aware of them to a greater or lesser degree in your work. These are: (1) a dollar oriented society; (2) a concept of mathematics *as* science; (3) the great difficulty of recruiting high caliber men into taxonomy in the face of the enormous popular appeal of physics, and some areas of chemistry and medicine. This "recruitment" problem is enhanced by the weakening of the naturalist tradition in so far as entomology is concerned. Of this I shall have a few more words to say subsequently.

I shall now turn to the third of the three factors contributing to what I consider shortcomings in the ability of the taxonomist to meet his responsibilities. This factor is the result of the actions of the entomological profession itself. Of these, certainly the greatest is the lack of understanding of the entomological function of modern taxonomy. Unless the general entomologist can understand what taxonomy well done can, both directly and indirectly, do for him, he will always think of taxonomy as a rather mumbo-jumbo kind of thing that occasionally names some odd looking but obscure, and probably unimportant, beast he found one spring morning on an apple leaf, or changes, by whim, and name of an insect he long ago learned. I remember having an entomologist tell me (jokingly I hope) that one of the taxonomist's chief problems was to convince the heads of entomological experiment stations that taxonomists were needed on their staffs. Here certainly is a prize case of lack of understanding on one hand, and lack of communication on the other. Incidentally, a free answer I give you few taxonomists in the audience is that, if the director is a firefighter he assuredly doesn't need a taxonomist, if he is really a research director he cannot afford to be without one.

This lack of understanding leads to lack of financial support (who *ever* has enough?) which in turn leads to lack of organized group effort. I am not going to suggest that all of the taxonomists be regimented, but much criticism has been leveled at the taxonomist for not solving important problems, when actually these problems are much too big and complex for a single individual to hope to untangle by himself, but are quite amenable to a group approach. These are frequently problems of the very greatest significance to the economic entomologist, for often they involve subtle differences between similar populations and they account very well for the otherwise perplexing questions as to why a given species is a pest in area A but not in area B where the environmental conditions seem almost identical. Also involved here can be heterosis, hybrid vigor, and like phenomena which are often completely impossible to comprehend unless the taxonomic knowledge of the group has reached an advanced level.

Let me give you an example from my own area of research, the hemipterous family Lygaeidae. For many years every student of the taxonomy of the group has known that the classification of the economically important chinch bug genus, *Blissus*, is in a most unsatisfactory condition. For instance, there has been a constant shifting back and forth of the eastern hairy chinch bug and the Florida pest of St. Augustine grass from full species, to subspecies, to variety, to synonym with an array of other "Forms" tagging along in motley array. The scientific specific name of the infamous midwestern chinch bug is probably incorrect, and it is likely that the true genus *Blissus* doesn't even occur in the Western Hemisphere. No two specialists seem able to agree on what one half of the grassland chinch bugs from the Great Plains are. I have often wondered how many Hemipterists could tell a hairy chinch bug without a locality label on it. Does this mean that lygaeid specialists are an intolerably incompetent group? Most assuredly not. It does mean we are spread horridly thin, but much more important, it means that we are faced with a complex group, possibly actively evolving, certainly profoundly influenced in habits, distribution, and genetics by man's agriculture. To have a reasonable understanding of this genus we must have ecological and bionomic information, statistical morphological data, rearing experiments, etc. I assure you this is expensive and cannot be done by a part time College Professor in the intervals between meeting classes, attending conferences on admission of Freshmen, and which fraternity drank too much beer with disastrous results to Molly Jones last Saturday night. However, the basic approach is well understood and I am sure a group project here could, in a short time, achieve very splendid results. Surely there is reason for at least a slight taste of bitterness in the mouth of the taxonomist when he thinks of the really lavish sums expended upon the chinch bugs and realizes that probably fifty percent of the worthwhile ten percent is useless because the populations studied have been composite and the results about as trustworthy as a series of DDT tests where methoxychlor was used one fourth of the time.

A second factor contributing to poor taxonomy is what I sometimes like to call the "control psychosis"; a phenomenon that equates value with immediate use and that talks glibly of basic science with words, but only rarely implements the golden words with acts. The failure of this policy should be apparent to anyone reading the news or studying the evolution of any one science. Permit me to look back upon entomological history for a moment. Please note that the period of greatest growth of our science coincided with the dominance of men who were really neither taxonomists nor economic entomologists *per se*. I think I shall point to that eminent taxonomist of the parasitic Hymenoptera, L. O. Howard for my example, and leave it there.

This "control psychosis" may be needed, and does have a place, but it has most serious consequences for the taxonomist in two ways: (1) It results in many capable young scientists being advised away from taxonomy. (2) It creates a climate of public opinion that is horrified by, and antagonistic to, insects in general—best expressed by that intellectually stimulating slogan "The only Good Bug Is a Dead Bug". This outlook divorces entomologists from the general interest in natural history and makes of all insects objects of hatred, fear, and dislike. A neutral observer might comment with wry amusement that the entomological profession has done such a superior job of making people fear and hate bugs that they have just about succeeded in making that same public hate and fear the entomologists themselves. I assure you we are in a crisis of personnel in Entomology. University after university is faced with dwindling undergraduate enrollments and this is being increasingly reflected in graduate schools as the glamor and salaries of the physical sciences pull increasing numbers of students to them.

A rather subtle but important factor where the general entomologist places barriers to the effective operation of the taxonomist, lies in expecting him to be more perfect than most men. Many entomologists become irritated with the taxonomist for changing names and, indeed, I must admit this irritation is sometimes justified. However, in general, the irritation is caused by a misconception of the

processes by which systematic knowledge of a group is obtained and by failure to visualize the groping struggle toward greater understanding in which the good systematic worker is engaged. Indeed, it is surprising sometimes to watch a man, who over a fifty year career may have changed his control recommendations fifty times, become incensed when taxonomic knowledge has increased sufficiently during that same period to show that two species exist where only one was previously known, and the name of HIS insect therefore had to be "changed."

And if I may be permitted just one word of plea, it would be well if the profession, both taxonomic and otherwise, would stop just a moment and try to understand what is involved when a new species or other new category is published. This is really not the word of God, it is merely someone saying, "On the basis of the following criteria, I propose that we consider this unit as a species different from any previously proposed. At this point we know little about it. Please let us study it more closely to see if I actually am correct in my opinion that it is a distinct entity." In this context it is to be hoped the entomologist will see his taxonomic brother as another plodder toward the truth rather than as a vessel to receive the Holy Word from a mystical taxonomic fountain.

One can, however, go on almost indefinitely pointing a finger at problems that hinder the work of the taxonomist. I would like your indulgence while I make a few comments upon what I think should be done to improve the situation. Some should be obvious to all of you from my foregoing remarks. These are such things as the teaching of taxonomic principles and methods by taxonomists, group projects on important species, greatly increased economic support and the rise of the creature known as the "economic taxonomist".

Specifically I wish to point out the need for greatly strengthening the Federal base of Taxonomy, regarding museum taxonomists as research men primarily, not as semi-skilled personnel hired chiefly to identify insects. We must obtain more original revisional and monographic work from our federal taxonomic heart. We must have a greatly increased effort to build a National Collection commensurate with a nation of our stature. Apparently this is a difficult thing to do, and the problem here is immediate. It involves all of you.

Now, how to bring this about? I am aware that J. F. Gates Clarke has worked very hard to create a National Institute of Entomology, but the difficulties to be overcome seem to be insurmountable. If we cannot greatly strengthen the existing structure, then it is imperative we try other approaches. The important thing is that something *must* be done, and soon. Let me throw out to you for consideration an alternative to Dr. Clarke's proposal. This alternative is to break up the taxonomic section of the Department of Agriculture now affiliated with the United States National Museum and distribute the taxonomists comprising it at strategic points over the country. Let me cite a hypothetical example of how this might work. Let us say we have a taxonomic specialist in the pyralid and noctuid moths. He is a "GS" of some odd category, assuredly not high. He is crammed into a small area. His professional contacts are chiefly other taxonomists crammed into similar small spaces. He lives in Washington or nearby. His costs are high. Most assuredly he is hot. Also, let us suppose that Rutgers University has a long and distinguished history in lepidopterous taxonomy with fine collections. The Washington specialist is moved to New Brunswick. He becomes a member of the graduate faculty. Students are able to learn from his hard earned knowledge. His professional contacts encompass the great variety of professional people associated with a great modern university. The university lends prestige to him. A worker funnels the routine requests for identification to his assistant and to the assistants of his opposite numbers in other areas of taxonomy. Who loses what? More mail handling, probably a few more reports to prove he really did come to work at 8:30 A.M. Wednesday morning, some loss of stimulating fellow taxonomists. But I think the good of such diffusion might so vastly outweigh the really minor drawbacks that would be encountered that most of the things Dr. Clarke envisages would be realized without the enormous initial expenses that loom as such a black spectre behind his proposals. At any rate, the important thing is that some new ideas are very badly needed.

Second, we need a really serious effort to produce up-to-date, attractive, usable manuals to our insects. It seems to me that, with not very many important exceptions, most teaching of insect identification is done by using manuals emanating from the pen of the late amateur entomologist, W. S. Blatchley. I do not know of any comprehensive manuals in preparation, and here is a place where a regional or national organization could really do something concrete to help itself and, at the same time, relieve pressure on overworked taxonomists.

Third, it is probably time for taxonomists to stop taking their talents so cheaply. Few people expect free chemical analyses, and I find that medical bills come in. But I also find mighty few people who hesitate to ask the taxonomist to spend a few odd hours dissecting leaf hopper genitalia to see if this one is the virus carrier or not.

The heart of any systematic effort is the Museum. We need greater support here. All of our so-called great museums are grossly understaffed and, what is more, relatively understaffed entomologically. A single man in one devoted lifetime can amass in a given order, nearly as large a collection as is present in any of our museums. I know this to be true for I have seen it done. Yet, there seems little agitation on the part of the general entomologist to try to improve this condition, or even to make the directors of museums and the general public aware of the enormity of the existing discrepancies.

Lastly, we need a much greater effort to encourage the study of insects as objects of Natural History. We need this not only as a source of outstanding young talent, but also to create strong amateur groups to support our fascinating science for its own sake, for its intrinsic value as the most varied, most unbelievable and most numerous of all the animals. I find it less than creditable to the society that such an eminent entomological naturalist as Edwin Way Teale has never once found it appealing to attend a meeting of this branch.

The taxonomist is like all the other scientists of the world. He will meet his responsibilities in direct proportion to the support, prestige, understanding, and consideration he is given.

If he is falling short of meeting these responsibilities, the fault is indeed, in part his own, but, I assure you with all sincerity, the fault is also partly yours.

THIRD CONFERENCE ON AGRICULTURAL METEOROLOGY

A conference on Agricultural Meteorology will be sponsored by the Kansas City Seminar of the American Meteorological Society and members of cooperating societies on May 18–19, 1960. The conference will provide opportunities for the discussion of relationships between the plant and animal sciences and meteorology.

Special sessions for discussion of important problems relating to agricultural meteorology are planned. One session will include a discussion of specialized forecasting and climatological weather services to agriculture. Another special session will include discussions of bioclimatic relationships with special reference to phenology and ecology. Sessions dealing with other phases of agricultural meteorology are also planned and papers are invited for these sessions.

The ESA Representative will be J. T. Medler of the University of Wisconsin.

MINUTES OF THE OPENING SESSION, PRELIMINARY BUSINESS MEETING AND FINAL BUSINESS MEETING

DETROIT MEETING—ENTOMOLOGICAL SOCIETY OF AMERICA

Detroit, Michigan—November 30-December 3, 1959

OPENING SESSION

November 30, 1959

The meeting, which was the first joint meeting of the Entomological Societies of America, Canada and Ontario, was called to order at 9:00 A.M. by President P. W. Oman of the Entomological Society of America in the Grand Ballroom of the Sheraton-Cadillac Hotel. An attendance of about 500 was estimated. President Oman introduced a representative of Mayor L. C. Miriani of Detroit who welcomed the members of the three Societies to the city. President M. L. Prebble of the Entomological Society of Canada introduced a representative of Mayor M. J. Patrick of Windsor, Ontario who extended greetings on the part of that city.

Preliminary announcements were made by Executive Secretary R. H. Nelson.

President Prebble then introduced P. W. Oman who presented the Entomological Society of America presidential address *"The Relation of Insect Taxonomy to Applied Biology."* This will be found in this issue of the BULLETIN.

Following his address President Oman introduced M. L. Prebble who gave the presidential address of the Entomological Society of Canada. This address entitled *"Biological Control in Forest Entomology,"* is printed elsewhere in this number of the BULLETIN.

Both presidential addresses were well received. Following these presentations President Oman announced a ten minute recess.

President Oman took the chair and again called the meeting to order at 10:20 A.M. He introduced Dr. Edward A. Steinhaus of the Department of Biological Control, University of California who had been chosen to deliver the annual Memorial Lecture which was in honor of C. V. Riley. This lecture entitled *"Insect Pathology: Challenge, Achievement and Promise,"* is printed in this periodical. The enthusiastic reaction of the audience to Dr. Steinhaus' scholarly discourse was indicative of its clarity and appeal. President Oman commented upon the address and congratulated Dr. Steinhaus upon his maintenance of the high standards of the Memorial Lecture series.

President Oman then noted the end of the Opening Session and declared a recess to permit the members of the Entomological Society of Canada to adjourn to the Crystal Ballroom for their preliminary business meeting.

PRELIMINARY BUSINESS MEETING

November 30, 1959

The Preliminary Business session was called to order by President P. W. Oman at 11:20 A.M. He requested the Executive Secretary to report briefly to the members in attendance.

1. REPORT OF THE EXECUTIVE SECRETARY

a. Finances. The Auditor's Report, which is to be printed in the March 1960 BULLETIN, was mentioned and its study recommended. Summary figures as follows, were read.

General Fund—Gain during the year.....	$1,504.55
Permanent Fund—Interest and increment during the year..... ($24,000.00 withdrawn at the end of the year)	1,338.45
Thomas Say Foundation—Interest and sales during the year..... (New Thomas Say book paid for after end of Fiscal Year)	545.89

b. Membership. The total membership of the Society as of September for 1956, 1957 and 1958 as well as 1959 is summarized below. We are continuing to grow.

CLASS	*Number of Members as of September*			
	1956	1957	1958	1959
Active	3343	3627	3747	3807
Emeritus	49	58	66	73
Honorary	9	9	10	12
Life	68	68	68	66
Student	278	327	303	351
TOTALS	3747	4089	4194	4309
NET GAIN		342	105	115

c. Periodicals. The members were referred to the Report of the Managing Editor for information on the progress of the ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA and the JOURNAL OF ECONOMIC ENTOMOLOGY. (That report is published in this number of the BULLETIN.)

d. Index to the Literature of American Economic Entomology. INDEX 16 was published in 1959 and members were furnished with order blanks. It was noted that the members price of $4.00 applied for personal purchase only. The non member price is $6.00.

e. Annual Review of Entomology. The high standards of this annual book have been maintained by Editor E. A. Steinhaus and Associate Editor Ray L. Smith. Members are furnished order blanks each year. The final payment on the subsidizing of this venture by the Society is to be made in 1960. The continued support of all members was asked since the ANNUAL REVIEW OF ENTOMOLOGY will become a source of financial support of the Society.

f. Miscellaneous Publications of the Entomological Society. This periodical got under way late in 1959 with Volume 1, Number 1 appearing in October. Jerome G. Rozen Jr., was selected as Editor. The numbers are to appear irregularly and each Volume will contain some 200 pages.

g. Thomas Say Foundation. Volume 6 of the THOMAS SAY FOUNDATION was published in 1959. This is, "A Synoptic Catalog of the Mosquitoes of the World," by Alan Stone, Kenneth L. Knight and Helle Starcke. The book has received wide acclaim and acceptance. The Foundation had insufficient funds to pay the entire printing bill and the needed money was loaned from the General Fund after the end of the Fiscal Year. When purchased out of personal funds the members price for this book is $6.50. The non-member price is $7.25.

h. Election Results. Dr. H. M. Harris was elected President-Elect for 1960 and will become President in 1961. Dr. Dale R. Lindsay (Section D) and Mr. R. W. Sherman (Section E) were elected to the Governing Board. Dr. Fred C. Bishopp and Mr. C. F. W. Muesebeck were elected to Honorary Membership. The Southeastern (formerly Cotton States) Branch elected Dr. L. D. Newsom and the Pacific Branch Dr. C. B. Philip to the Governing Board.

i. Home for the Society. The purchase of a new home for the Society at 4603 Calvert Road in College Park, Maryland was announced. The members were asked to note the discussion of the house scheduled to appear in the December 1959 issue of the BULLETIN.

At the Salt Lake City meeting in 1958 the membership voted to permit the use of up to $25,000.00 of the Permanent Fund as a down payment on a house and authorized

the President to appoint a committee, which with the advice and consent of the Governing Board, was to select a home for the Society.

President Oman appointed Morris Rockstein, Neely Turner and R. H. Nelson as the committee to consider the matter. The committee decided in favor of the suburbs over down town Washington and recommended the house in College Park to the Governing Board. The house and ½ acre lot were appraised at $41,500.00. An offer of $35,000.00 was made and settlement agreed upon at $37,500.00.

The Executive Secretary commended Dr. Rockstein, *Chairman* and Mr. Turner for all the time and effort they spent. He also commented upon the careful and thorough study made by George Hutton in 1958.

It was announced that it was planned to move the office to the new quarters about January 15, 1960. With much improved quarters and working space it is hoped that much better service can be extended to the members.

j. Travel Grants. The Society has obtained a grant of $10,000.00 from the National Institutes of Health and one of $22,500.00 from the National Science Foundation. These funds are to be used in making grants to about 40 entomologists to enable them to attend the XIth International Congress of Entomology in Vienna on August 17–25, 1960. Announcements were mailed to members. A Committee has been appointed by President Oman to screen applications. Since only a limited number can get grants we hope those who do not receive funds will understand.

k. Governing Board. The 1959 Governing Board began meeting on Saturday morning November 28 and continued on Sunday November 29. The Board finished their deliverations on Sunday afternoon and adjourned. This permits the Board members to attend any or all sessions of the meeting as they wish—a highly desirable situation due largely to the efficient planning and direction of President Oman, whose report follows.

2. Report of the President

In his report President Oman reviewed actions by the Governing Board covering the following items.

a. Future Meeting Places. The Board selected Phoenix, Arizona and the Westward Ho Hotel for the December 3–6, 1962 meeting. The Board also designated St. Louis, Missouri as the city for the December 2–5, 1963 meeting. The hotel was to be selected later. The Board noted that, as previously announced in the Bulletin, the November 28-December 1, 1960 meeting is to be held at the Chalfont-Haddon Hall in Atlantic City, N. J. and the November 27–30, 1961 meeting at the McAllister Hotel in Miami, Florida.

b. Programs. With regard to programs of future meetings it was reported that the Governing Board favored the planning of field excursions whenever meetings were held in a location suitable geographically. It was announced that the deadline for the receipt of titles and abstracts for inclusion in the program of the annual meeting was advanced to August 15 beginning in 1960. This is a change from the previous deadline of September 1.

c. Standing Committees. The Governing Board recommends to the Society that the standing *Committee on Insect Surveys* be changed to incorporate the functions of the special *Committee on Insect Losses*, that the name of the former be the *Committee on Insect Surveys and Losses*, that a separate *Committee on Insect Losses* not be appointed and that the membership of the standing *Committee on Insect Surveys and Losses* shall have in addition to the original 10 members an additional *ex officio* member who shall be the Executive Secretary of the Armed Forces Pest Control Board.

The Governing Board also recommends to the Society that a new standing *Committee on Memorial Lectures* be established. The Committee shall consist of five members. Each year it shall select an outstanding member of the Society to present a memorial lecture dedicated to the memory of a distinguished North American entomologist. The lecturer may describe his own research or summarize knowledge in some area of entomology.

d. Program format. The format of the printed program was noted and the members were advised that a show of hands for and against the new format would be called for at the final business meeting.

e. Committee on Public Relations and Welfare. The words "and Welfare" are to be deleted from the name of this special committee. The 1959 committee made definite recommendations regarding future activities along the line of public relations and the Governing Board approved those recommendations.

f. North Central Branch Resolution. A Resolution from the North Central Branch of the Society regarding the practice of numbering the annual meetings of the Entomological Society of America was considered by the Governing Board, and the Board's action called for abandonment of the numbering system for annual meetings of the ESA, and instructions that the programs and other official publications bear the seal of the Society showing the three critical dates in our history. For purposes of seniority, the Society should use the date 1889.

g. Branch Funds. Mention was made of the request from Branches for allocation of funds to the Branches for operating expenses. It was also stated that the Governing Board is sympathetic with the requests of Branches for aid in the solution of their financial problems, but the Board does not feel that the allocation of $1.00 per Branch member is a permissable solution of the problem.

3. Miscellaneous Business

President Oman asked if there were any questions or matters for discussion from the floor. Mr. H. M. Armitage asked what was meant by the phrase ". . . by vote of the Society . . ." as found in the Constitution. Does it mean members at a meeting or a mail ballot? President Oman referred the question to Parliamentarian W. M. Rogoff and asked that Dr. Rogoff discuss the matter at the final business meeting.

4. Recess

The meeting adjourned at 12:15 P.M. to reconvene following the address of the Guest Speaker, Dr. J. J. Weiser, on Wednesday December 3.

FINAL BUSINESS MEETING

December 2, 1959

The meeting was called to order at 4:06 P.M. by President Oman. This call was immediately following the address of the Guest Speaker J. J. Weiser from Czechoslovakia at the Plenary Session. The Society obtained a grant from the Rockefeller Foundation to bring Dr. Weiser over to our meeting.

The attendance at the final business session was estimated at over 400.

1. Ruling of the Parliamentarian

President P. W. Oman opened the meeting with the statement that the first business for consideration related to a procedural matter and called upon Parliamentarian Wm. G. Rogoff to answer the question raised by Mr. H. M. Armitage at the preliminary business meeting, regarding the meaning of the expression in Article X Section 1 of the Constitution ". . . by vote of the Society . . ." Dr. Rogoff gave his interpretation of this expression, pointing out the precedents set in 1954 and in 1956 when Standing Committees were established by the Society members at annual meetings. He interpreted the expression ". . . by vote of the Society . . ." to mean by vote of the members at an annual meeting or by mail ballot as established by precedent.

2. Old Business

President Oman outlined the circumstances relating to proposed constitutional amendments presented to the Society at the 1957 Memphis meeting and which were by vote of the Society at that time "referred to committee." A part of the motion passed called for the succeeding two Presidents following the Memphis meeting to operate under the present Constitution. A *Committee on Constitutional Amendments*, under the Chairmanship of B. A. Porter, appointed by President R. L. Metcalf at the 1958 Salt Lake City, Utah meeting, had been requested by President Oman to consider the status of these pending proposed amendments and make recommendations to the Society at the Detroit meeting. President Oman then called upon Dr. Porter to make his report.

Special Committee on Amendments to the Constitution

REPORT NO. 1

Amendments Considered at 1957 Meeting at Memphis

President Oman has asked this Committee to make recommendations on the series of amendments that were presented at New York in 1956, discussed at Memphis in 1957, and finally "referred to committee." These proposals seem to be still pending.

After careful study of all the factors involved, this Committee recommends that the 1959 Annual Meeting vote to drop from further consideration the series of proposed amendments to the Constitution that were referred to committee by the Memphis meeting in 1957.

C. C. Alexander

(signed)

William E. Bickley

(signed)

B. A. Porter, *Chairman*

Dr. Porter then moved the adoption of Report No. 1 and that the proposed amendments discussed therein be laid on the table. The motion was seconded by M. P. Jones and carried unanimously.

President Oman next called on Dr. Porter for the report of his committee relating to the proposed amendment to Article XII of the Constitution presented and considered at the 1958 Salt Lake City meeting and referred to the *Committee on Constitutional Amendments* at that time.

Special Committee on Amendments to the Constitution

REPORT NO. 2

Proposed Amendment of Article XII

The undersigned Committee was appointed by President Metcalf to consider a proposed amendment to Article XII, (Amendments) of the present Society Constitution, prepared by Col. Ralph W. Bunn, considered by the Governing Board, and presented at the annual business meeting at Salt Lake City on December 3, 1958.

In general the Committee favors the proposed amendment, but recommends that, before it is submitted to the membership for a mail vote, the 1959 annual meeting make the changes outlined in the attached revised draft. Some of the suggested changes are editorial; reasons for the more important ones are outlined below.

Section 2. It seems desirable to give the Executive Secretary more discretion in selecting the means whereby a proposed amendment is to be called to the attention of the membership. In some situations, it might be more feasible to distribute copies of the proposals with other material that is being mailed out, such as run-off ballots, bills for dues, or other announcements.

If a proposed amendment is to be published in the fall Bulletin a shorter minimum interval between publication and the annual meeting would seem desirable. This number of the Bulletin usually comes out more than 30 days before the annual meeting but the margin is sometimes narrow, and there is always the possibility of strikes or other unexpected delays.

Section 3. No specific provision seems to have been made for any modification of a proposed amendment after its initial submittal to the Executive Secretary. It appears to the Committee that there should be provision for clarification of any wording that careful study shows to be ambiguous or not clear, or to simplify any proposed procedures that appear awkward or unworkable. It also appears that the Governing Board could best propose such modifications as part of its responsibility to consider pending amendments and to make recommendations relating to them.

Because of the tragic death of one of the Committee members, C. C. Alexander, less than a week after the Committee's meeting on May 7, this report is signed by only two members. However, we believe that the report reflects the thinking that he expressed at that meeting.

C. C. Alexander

(signed)

William E. Bickley

(signed)

B. A. Porter, *Chairman*

Dr. Porter then read, Section by Section, the proposed amendments of Article XII. The recommendations in Report No. 2 were made in accordance with the present Article XII.

Dr. Porter then moved the adoption of Report No. 2 and that the meeting approve the amendments as now reworded. This was seconded by O. I. Snapp. The chair called for discussion noting that the present Article XII provides that the meeting may make changes germane to the subject and purpose of the amendment.

Roy Hansberry noted that the proposed Section 5 contained a phrase reading in part, "a vote shall be *taken* . . ." He requested clarification of *taken*. The Executive Secretary suggested substituting, "a mail ballot shall *then be sent* . . ." This was accepted by Dr. Porter and Mr. Snapp.

J. L. Horsfall noted that we are amending the Constitution by substituting a new Section XII for the present Section XII. He asked that this be made clear. This was acceptable to Dr. Porter and Mr. Snapp and an explanation was prepared by the Committee.

These changes having been made the motion was put to a vote and carried unanimously.

Proposed Amendment[1]

THE ENTOMOLOGICAL SOCIETY OF AMERICA

CONSTITUTION

ARTICLE XII

Amendments

Section 1. Any proposal for amendment or amendments shall first be submitted in writing to the Executive Secretary of the Society over the signature of a majority of the Governing Board or of fifty or more voting MEMBERS of the Society. Such proposals must be submitted to the Executive Secretary at least four months before the annual meeting at which action thereon is to be taken.

Section 2. ~~The Executive Secretary shall arrange for proposals for amendment to be printed in an issue of the BULLETIN appearing at least 30 days before the annual meeting at which action thereon is to be taken.~~ *At least 21 days before the annual meeting at which action is to be taken, the Executive Secretary shall mail to all members a copy of the proposed amendment. This may be by publication in the* BULLETIN, *or in any other manner, at the discretion of the Executive Secretary.*

Section 3. The Governing Board shall consider all proposals for amendment or amendments and develop recommendations with respect thereto to present to the members at the annual meeting. *In its consideration of an amendment the Governing Board may make minor changes in the proposed amendment to clarify obscure language, may modify details of procedure set forth in the proposed amendment, to make it more workable, or make other minor changes to facilitate carrying out the purpose of the amendment.*

Section 4. Proposals to amend, duly made in the above manner, shall be laid before the members of the Society at an annual business meeting for discussion and vote. The recommendations of the Governing Board concerning such proposals shall be duly considered.

Section 5. If a proposed amendment is approved by a two-thirds vote of members present, it shall be printed in the next possible issue of the BULLETIN together with the *part of the Constitution that would be affected by the proposed amendment, as it appears in the most recent printed copy of the Constitution. The* reason for the proposed amendment and the recommendations (*pro and con*) of the Governing Board concerning its passage *shall also be printed with the proposal. In the event the Governing Board is opposed to the proposed amendment, supporting comments of the group originating the amendment shall also be included.* A mail ballot *shall then be sent* to the entire voting membership ~~shall then be taken~~ not less than 30 days after ~~appearing~~ *the proposed amendment appears* in the BULLETIN.

Section 6. The President shall name a special committee of three members to canvass the ballots, one of whom shall be the Executive Secretary. Six weeks after distribution of the ballot, this committee shall tabulate all votes received and inform the President and the Members through the BULLETIN of the results of the ballot. ~~No amendment shall be ratified unless two-thirds of the Members voting on the proposal vote in its favor.~~ *If two-thirds or more of the ballots cast are in favor of the proposed amendment, it shall be adopted; otherwise it shall be lost.*

Section 7. ~~Amendments are effective as of the date of ratification unless otherwise specified.~~ *A proposed amendment, if approved by two-thirds or more of those voting, shall become effective as of the date the ballots are counted, unless a later date is specified in the amendment itself.*

[1] Portions through which lines are drawn represent deletions and portions in italics represent additions, made by the Annual Meeting at Detroit Dec. 2, 1959 in the proposed amendment that was presented at the Annual Meeting at Salt Lake City Dec. 3, 1958, published in the BULLETIN for March, 1959, (p. 18), and considered by a *Special Committee on Amendments to the Constitution.* See Report No. 2 of this Committee presented at Detroit Dec. 2, 1959.

3. NEW BUSINESS.

The chair called for additional old business. There being none the chair called upon the Executive Secretary to discuss various actions of the Governing Board.

a. Emeritus Members. The Executive Secretary read the list of 21 active members of long membership who have retired from active service and requested emeritus status. These were approved by the Governing Board.

CHARLES P. ALEXANDER	MACEO M. RICHARDSON
T. P. CASSIDY	W. R. THOMPSON
CYRIL F. DOS PASSOS	CHARLES H. BATCHELDER
C. O. EDDY	FRITZ CARPENTIER
F. A. FENTON	ROSCOE H. CARTER
STANLEY B. FRACKER	CHARLES E. COOLEY
REV. E. H. GIBSON	E. R. DE ONG
DWIGHT ISELY	CHARLES C. HILL
A. V. MITCHENER	ROWLAND W. LEIBY
D. D. PENNY	H. J. REINHARD

LOUIS A. STEARNS

b. Membership applicants. The *Membership Committee* reported 331 new member applicants to the Governing Board and these were approved by the Board. The register of these student and active applicants was displayed for the examination of interested members.

c. Budget. A budget of $146,500.00 estimated receipts and expenditures for the Fiscal Year 1960 was adopted.

d. Standing Committees. Reference was made to the recommendations of the Governing Board in regard to Standing Committees presented and fully explained to the preliminary business session by President Oman. In accordance with Article X, Section 1 of the Constitution and with the opinion of the Parliamentarian given earlier the Executive Secretary moved that the previously established *Committee on Insect Surveys* be called the *Committee on Insect Surveys and Losses* and that a new *Committee on Memorial Lectures* be established. The motion was seconded by Neely Turner. The chair called for discussion. There was none. The chair called for a vote which was unanimously in favor of the motion.

e. Standing Committee members. In accordance with Article VI Section 2 of the By-Laws the Governing Board presents nominations for vacancies on the various standing committees. Nominations can also be made from the floor. The cited Section of the By-Laws provides that the Governing Board shall designate the Chairman of each Committee. The Board nominations for Committee members were read by the Executive Secretary and in each case by a motion and second from the floor the nominees were unanimously elected by vote of the Society. The Chairmen designated by the Board were also read for each Committee. The resulting additions to the Standing Committees were as follows:

Program Committee. Member, D. O. Wolfenbarger. Chairman, R. W. Sherman.

Membership Committee. Members, George F. Knowlton and C. C. Burkhardt. Chairman, R. W. Rings.

Committee on Entomological Nomenclature. Members, P. O. Ritcher, W. J. Gertsch and R. L. Wenzel. Chairman, C. W. Sabrosky.

Committee on Common Names of Insects. Members, A. B. Gurney, H. F. Howden, S. L. Wood and W. J. Brown. Chairman, J. L. Laffoon.

Committee on Insecticide Terminology. Members, J. E. Brogden and J. E. Bussart. Chairman, C. N. Smith.

Committee on Insecticide Reference Standards. Member, A. J. Forgash. Chairman, J. E. Casida.

Committee on Insect Surveys and Losses. Members, J. R. Hughes and Herbert Knutson. Chairman, L. D. Newsom. Member *Ex Officio*, R. W. Bunn.

Committee on Finance. Member, H. G. Johnston. Chairman, S. E. Jones.

Committee on Professional Training, Standards and Status. Member, G. G. Gyrisco and C. D. Michener. Chairman, S. B. Freeborn.

Committee on Memorial Lectures. Members, L. D. Newsom, E. A. Steinhaus, B. N. Smallman, R. W. Sherman and C. B. Philip. The latter was designated Chairman.

f. Memorial Lectures. The 1960 Memorial Lecture will be in honor of John Henry Comstock while Thomas Say will be honored in 1961.

g. Committee reports. The Executive Secretary noted that much of the hard work in the Society is done by the various committees. The committee reports as printed in the BULLETIN should be read by all members.

h. Meeting attendance. The attendance at the Detroit meeting, the first joint meeting of the Canadian and American Societies, was 975 a new record.

i. Executive Secretary's thanks. The Executive Secretary took the occasion to extend personal thanks to his office force under Administrative Assistant Louise B. Stone and to Managing Editor F. W. Poos. Without their help, encouragement and loyalty the central office would surely fail. The Executive Secretary further expressed his thanks to President Oman under whom it had been both pleasant and stimulating to have served.

4. ADDITIONAL NEW BUSINESS.

President Oman announced the following additional actions taken by the Governing Board.

a. Executive Secretary's Salary. The Board voted to increase the salary of the Executive Secretary by $500.00 per annum.

b. XIth International Congress. The Board voted to pay the expenses of the Executive Secretary and of the President to the XIth International Congress of Entomology to be held in Vienna, Austria in August 1960, unless these travel expenses can be otherwise provided for.

c. Zoological Record. The Board voted to increase the ESA contribution to the *Zoological Record* from $100.00 to $200.00 effective in 1960.

5. REPORT OF THE RESOLUTIONS COMMITTEE

President Oman then called for the Report of the *Resolutions Committee.* Chairman R. W. Rings read the resolutions. He moved the adoption of each resolution. All these motions were seconded from the floor and all carried.

Resolution #1. WHEREAS, the Society has been deprived of the contributions and friendship of several members by death since the last annual meeting,

BE IT RESOLVED, that this Society, which through its Executive Secretary has extended sympathy to the families of the deceased, further show its respect by a reading of the roll.

C. C. Alexander
D. Manuel Aullo Costilla
Ernest A. Back (Life)
Arthur C. Baker
Philip F. Bonhag
Owen Bryant
John E. Dudley, Jr. (Emeritus)
S. W. Edgecombe
C. L. Fluke (Emeritus)
Francis B. Foley
Freeman M. Fuller, Jr.
Wm. J. Gerhard (Charter)
Arthur Gibson (Emeritus: Past President)
Howard H. Jewett
George P. Mackenzie
Robert Matheson (Emeritus)
Herbert Matsumori
C. B. Nickels (Emeritus)
H. R. Painter
H. V. Smith
Herbert D. Smith
Willis E. Snow
Arnold P. Sturtevant
O. H. Swezey (Emeritus)
M. A. Vogel
P. S. Welch (Emeritus)
Fenton T. West
C. B. Wisecup
H. F. Wilson
James Zetek (Emeritus)

Resolution #2. *WHEREAS,* the Executive Secretary of the Society, Robert H. Nelson, has carried out his duties in a most commendable and efficient manner,

BE IT RESOLVED, that the membership of the Society express its hearty thanks to Mr. Nelson and his staff for a job well done.

Resolution #3. *WHEREAS,* the *Program Committee,* under the leadership of B. N. Smallman, *Co-chairman,* and E. H. Smith, *Co-chairman,* has most successfully integrated and coordinated the programs of the Entomological Society of Ontario, the Entomological Society of Canada and the Entomological Society of America at a considerable expenditure of time and effort.

BE IT RESOLVED, that the Society, through its Executive Secretary, express its sincere appreciation to the members of this Committee for the excellent and memorable program which has been presented at this meeting.

Resolution #4. *WHEREAS,* the *Local Arrangements Committee,* D. G. Peterson, *Co-chairman* and Fred W. Fletcher, *Co-chairman* has, through their concentrated and coordinated efforts, made a major contribution to the success of this meeting, and WHEREAS, the wives of the *Local Arrangements Committee,* have served on the *Ladies Entertainment Committee,* Chairman, Mrs. Fred W. Fletcher, and have provided appropriate entertainment for wives of visiting entomologists,

BE IT RESOLVED, that the Executive Secretary express the appreciation of the Society to each member or married couple on these Committees for their considerable service.

Resolution #5. *WHEREAS,* the *Exhibits Committee,* Arnold Mallis, *Co-chairman,* and D. B. Waddell, *Co-chairman* has arranged for both educational and commercial exhibits, which have attracted much attention and admiration at this convention,

BE IT RESOLVED that the Society acknowledge the work of the Committee with deep appreciation.

Resolution #6. *WHEREAS,* the *Photo Salon Committee,* under the leadership of H. A. U. Munro, *Co-chairman,* and L. D. Christenson, *Co-chairman,* has provided an outstanding exhibit of entomological photographs, which has stimulated interest in artistic illustration in the science of entomology,

BE IT RESOLVED, that the Committee be duly commended by the Society and that appreciation be expressed to those who have spent considerable time and effort in selecting and preparing their entries.

Resolution #7. *WHEREAS,* the activities of the *Publicity Committee,* W. G. Friend, *Co-chairman,* and R. L. Janes, *Co-chairman,* have most efficiently disseminated information on entomological advances to the public, thereby stimulating renewed interest of the layman in entomological endeavors,

BE IT RESOLVED, that their efforts on behalf of the Society and the profession of entomology be duly recognized and expressed by the Society through the Executive Secretary.

Resolution #8. *WHEREAS*, this meeting in Detroit has been the first joint one of the Entomological Society of Ontario, the Entomological Society of Canada, and the Entomological Society of America, and

WHEREAS, entomologists of both nations have, as a result of this meeting, become increasingly aware of insect problems of mutual interest, and

WHEREAS, the international exchange of entomological information has benefited scientists in both the Dominion of Canada and the United States of America, and

WHEREAS, a most singular spirit of international cooperation, uncommon in the world of today, has prevailed throughout this joint meeting,

BE IT RESOLVED, that the Entomological Society of America, through its Executive Secretary, convey to the respective Presidents of the Entomological Society of Ontario and the Entomological Society of Canada its sincere appreciation for the scientific contributions of their members at this meeting, its sincere appreciation for the assistance of their members in program development, local arrangements, publicity and exhibits, its high esteem for the sister Societies in Canada, and the warm feeling of friendship that its members have for the members of the Canadian Societies.

Resolution #9. *WHEREAS*, the lack of titles in literature citations in the ANNUAL REVIEW OF ENTOMOLOGY has led to great inconvenience for most readers of this publication, even though precedents are being followed; and

WHEREAS, inclusion of full or abbreviated titles should not necessitate an unreasonable increase in total number of pages in each volume; and

WHEREAS, elimination of one article per volume might supply the necessary pages for improvement of the literature citations should an increase in total pages be impossible;

BE IT RESOLVED, that the President of the Entomological Society of America appoint a committee to work with the editor of the ANNUAL REVIEW OF ENTOMOLOGY toward the goal of making the literature citations of articles in the Review more useful by inclusion of full or abbreviated titles.

Resolution #10. *WHEREAS*, the office of Extension Entomologist, Federal Extension Service, U.S.D.A., has provided state extension entomologists and others with a valuable service in supplying extension and research literature, liason with other governmental and state agencies and

WHEREAS, these services have kept the state extension entomologists alert to and abreast of the changing policies and situation, especially as it applies to insecticide label approvals and changes,

BE IT RESOLVED, that the Entomological Society of America request that the Administrative Assistant, Federal Extension Service continue the position of Extension Entomologist following the retirement of Mr. M. P. Jones who now occupies this position.

AND BE IT FURTHER RESOLVED, that the Executive Secretary of the Entomological Society of America be instructed to provide a copy of this resolution to the Administrator, Federal Extension Service, U. S. Department of Agriculture.

Respectfully submitted,

F. S. ARANT
J. R. EYER
C. L. FARRAR
C. H. HOFFMANN
R. D. SHENEFELT
H. S. TELFORD
R. W. RINGS, *Chairman*

5. ADDITIONAL BUSINESS

President Oman called for additional business. There were no comments from the floor.

a. Program format. The chair then asked for a show of hands first of those favoring, then of those opposing, the program format as used for the Detroit meeting. This had been briefly discussed at the preliminary business session. The response indicated that the format was highly favored.

b. Remarks by the President. President Oman then expressed his appreciation to members of the several committees, particularly the *Local Arrangements Committee*, the *Ladies' Entertainment Committee*, the *Exhibits Committee*, *Program Committee*, *Memorial Lecture Committee*, and *Photo Salon Committee*, that had contributed so much to making the Detroit meeting a successful one.

c. Introduction of President Jones. President Oman then requested Past-Presidents C. E. Mickel and E. G. Linsley to escort President-Elect M. P. Jones to the platform and turned the gavel over to Mr. Jones with sincere good wishes for a highly successful year as President of the Society. President M. P. Jones then presented Dr. Oman with a Presidential Certificate attesting to his having served as President of the Entomological Society of America during 1959. President Jones announced that similar awards have been sent to the six Past-Presidents who have served the present Entomological Society of America. President Jones expressed his appreciation on being honored with the office of President, asked the help of all concerned toward a memorable 1960 and toward a successful meeting in Atlantic City.

d. Introduction of President-Elect Harris. President Jones requested Past-Presidents E. F. Knipling and B. A. Porter to escort President-Elect H. M. Harris to the platform. President Jones then extended congratulations to President-Elect Harris upon his election and especially upon his outstanding record of devoted service to the Entomological Society of America. President-Elect Harris responded by thanking President Jones, by expressing his appreciation for the honor bestowed and by extending greetings to all members of the Society with a firm belief in its continued development.

f. Adjournment. President Jones called for any final business. There being none the meeting adjourned at 5:45 P.M.

Respectfully submitted,

R. H. NELSON, *Executive Secretary*

ACTIONS OF THE 1960 GOVERNING BOARD

Initial Meeting, December 3, 1959

The initial meeting of the 1960 Governing Board was called to order by President M. P. Jones at 9:00 A.M. on December 3.

1. XITH INTERNATIONAL CONGRESS OF ENTOMOLOGY

The Board suggested that the President appoint not more than 10 official delegates to this Congress but as many other delegates as he wishes.

2. MEMORIAL LECTURE.

The Sponsorship of the Annual Memorial Lecture by the BIOFERM CORPORATION, a Sustaining Associate, was noted with approval. It was voted that the idea of

an annual medal for this Lecture recommended by a previous *Memorial Lecture Committee* be dropped.

3. Hotel Room Rates

There was discussion of the hotel room rate situation. The Executive Secretary was directed to write a letter of protest to the management of the local hotel since reservations made in writing were in many cases not honored at the stated rate. The Executive Secretary announced that flat rates for Society members will prevail at the Chalfonte-Haddon Hall at the 1960 meeting. This will not apply to rooms or suites engaged in the name of Institutions or Commercial Organizations. The Board recommended the flat rate idea for all future meetings where possible.

4. Section Meetings

Following a request from Section A which was based on a motion passed at their business meeting the Board voted that the President appoint a Committee to encourage and coordinate Section meetings with the A. I. B. S. or otherwise encourage liaison with meetings of that Institute. The Constitution of the Society makes provision for such meetings of Sections.

5. Adjournment

The meeting adjourned at 10:30 A.M.

Respectfully submitted,

R. H. Nelson, *Executive Secretary*

REPORT OF THE AUDITOR

November 17, 1959

Dr. P. W. Oman, *President*
Entomological Society of America
1530 P Street, N. W.
Washington, D. C.
Dear Dr. Oman:

In accordance with the recent request of Mr. R. H. Nelson, Executive Secretary of the Entomological Society of America, I have made an examination of the financial affairs of your Society for the year beginning November 1, 1958, and ending October 31, 1959. As a result of my examination, there are attached the following exhibits:

EXHIBIT "A" General Fund—Statement of Receipts and Disbursements for the year beginning November 1, 1958, and ending October 31, 1959.

EXHIBIT "B" Permanent Fund—Statement of Receipts and Disbursements for the year beginning November 1, 1958, and ending October 31, 1959.

EXHIBIT "C" Entoma—Statement of Receipts and Disbursements for the year beginning November 1, 1958, and ending October 31, 1959.

EXHIBIT "D" Thomas Say Foundation—Statement of Receipts and Disbursements for the year beginning November 1, 1958, and ending October 31, 1959.

Branch funds have not been accounted for in this report. There are at present five branches. Each branch has its own bank account, and has the authority to make expenditures for its activities and to receive registration fees for its meetings. These branches are not required to account to the Entomological Society of America for their receipts and expenditures.

Upon delivery of this report a conference will be held with your Executive Secretary and office staff to simplify procedures in recording the financial transactions of your Society.

In my opinion, subject to the above comments, the accompanying statements fairly reflect the recorded cash receipts and authorized disbursements made for the benefit of Entomological Society of America for the period beginning November 1, 1958, and ending October 31, 1959, on a basis consistent with that of previous periods.
Very truly yours,

John A. Herl
Certified Public Accountant

EXHIBIT "A"

Entomological Society of America

GENERAL FUND

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1959

BALANCE NOVEMBER 1, 1958		**$ 17,667.07**
RECEIPTS		
Membership Dues—Previous Years	$ 255.50	
1959	10,931.45	
Future Years	176.50	
Membership Journal Subscriptions—		
Previous Years	768.05	
1959	22,202.41	
Future Years	454.00	
Non-Member Journal Subscriptions—		
Previous Years	375.60	
1959	22,944.16	
Future Years	2,898.92	
Membership Annals Subscriptions—		
Previous Years	338.50	
1959	8,465.50	
Future Years	312.00	
Non-Member Annals Subscriptions—		
Previous Years	140.90	
1959	6,326.01	
Future Years	1,239.70	
Bulletin Sales—Members	9,067.63	
Non-Members	594.20	
Sale of Indicies—		
No. 16	158.00	
Others	888.06	
Sales of Annual Review	6,503.15	
Reprints—Journal	15,006.55	
Annals	3,565.34	
Bulletin	302.57	
Advertising—Journal	3,132.03	
Annals	690.03	
Bulletin	117.50	
Paid Papers—Journal	1,175.95	
Annals	896.31	
Sales of Back Issues—Journal	1,995.79	
Annals	1,432.03	
Sustaining Associates—1959	4,200.00	
Addressograph Services	381.49	
Books for Entomological Society of Washington	18.17	
Brochure No. 1	161.43	
Contributions	113.13	
Entoma	714.50	
History of Entomology	96.00	
Insect Facts	7.52	
Meeting Income	6,611.74	
Miscellaneous Publications	71.00	
Overpayments	18.50	
Returned Checks Made Good	132.25	
Refunds	648.32	
Sale of Adding Machine	40.00	
Subscription Services	8.35	
Thomas Say Foundation	66.40	
Travel Grant	980.78	
Transfers from Permanent Fund	24,000.00	
Dues Overpaid	62.25	
Dividends—Interstate Building Association	172.79	
Net Bank Fees on Foreign Exchange	17.17	
Payroll Taxes Withheld	5,961.46	
TOTAL RECEIPTS		**167,837.59**
TOTAL CASH TO BE ACCOUNTED FOR		**$185,504.66**

NOTE: The comments form an integral part of this statement.

TOTAL CASH TO BE ACCOUNTED FOR	**$185,504.66**

DISBURSEMENTS		
Journal—Printing and Mailing	32,325.20	
Engraving	1,762.01	
Reprints	6,482.31	
Annals—Printing and Mailing	21,262.83	
Engraving	2,157.69	
Reprints	1,604.08	
Costs—Back Issues—Journal	574.95	
Annals	1,788.40	
Annual Review	7,805.22	
Bulletin Expense	7,105.43	
Miscellaneous Printing	1,902.63	
Index 16	1,299.00	
Telephone and Telegraph	216.82	
Office Supplies and Expense	1,353.10	
Purchase of Office Furniture and Fixtures	819.38	
Postage	2,580.25	
Refunds—Dues	36.00	
Subscriptions	80.75	
Travel Expense	2,457.20	
Meeting Expense	4,327.00	
Payroll Taxes—Employees' Portion	5,530.53	
Employer's Portion	656.50	
Salaries and Wages	34,643.85	
AIBS—Dues	1,000.00	
Advertising	140.00	
Auditing Services	300.00	
Books for Entomological Society of Washington	18.17	
Contributions	110.00	
Entoma	3.00	
Purchase of Land and Building	23,749.09	
Insurance	77.62	
JEE Index	65.00	
Meeting Expense—World Health Organization	14.45	
Postage Meter Permit	20.00	
Refunds	21.40	
Returned Checks	147.25	
Safe Deposit Box Rental	5.50	
Subscription Service	8.25	
Transfer of Funds—Thomas Say Foundation	401.40	
Travel Grant	980.78	
Retirement Annuity—Executive Secretary	500.00	
TOTAL DISBURSEMENTS		**166,333.04**
BALANCE OCTOBER 31, 1959		**$ 19,171.62**
ABOVE BALANCE ACCOUNTED FOR AS FOLLOWS:		
Cash in National Bank of Washington	$14,240.39	
Petty Cash	135.85	
Cash in Interstate Building and Loan Assn. (Building Fund)	4,795.38	
TOTAL		**$ 19,171.62**

NOTE: The comments form an integral part of this statement.

EXHIBIT "B"

ENTOMOLOGICAL SOCIETY OF AMERICA

PERMANENT FUND

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1959

BALANCE NOVEMBER 1, 1958		**$ 31,130.15**
RECEIPTS		
Interest on Province of Ontario Bonds	$ 100.00	
Profit on Sale of Ontario Bonds	91.35	
Dividend Income—Perpetual Building Assn.	286.57	
First Federal Savings and Loan Assn.	377.89	
District Building and Loan Assn.	294.14	
Increment in Redemption Value of Series F, U. S. Treasury Bonds	188.50	
TOTAL RECEIPTS		**1,338.45**
TOTAL CASH TO BE ACCOUNTED FOR		**32,468.60**
DISBURSEMENTS		
Transfers to General Fund		**24,000.00**
BALANCE OCTOBER 31, 1959		**$ 8,468.60**
ABOVE BALANCE ACCOUNTED FOR AS FOLLOWS:		
Face Value / Securities	Book Value	
$6,500.00 U. S. Treasury Bonds—Series F	$ 6,038.50	
CASH		
First Federal Savings and Loan Association	412.28	
District Building and Loan Association	29.05	
Perpetual Building Association	1,988.77	
TOTAL SECURITIES AND CASH		**$ 8,468.60**

NOTE: The comments form an integral part of this statement.

EXHIBIT "C"

ENTOMOLOGICAL SOCIETY OF AMERICA

ENTOMA

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1959

EDITIONS 12 AND 13

BALANCE NOVEMBER 1, 1958		**$ 491.06**
RECEIPTS–		
Book Sales	$ 397.02	
Advertising and Listing	692.20	
TOTAL RECEIPTS		**1,089.22**
TOTAL TO BE ACCOUNTED FOR		**$ 1,580.28**
DISBURSEMENTS		
Auditing Service	$ 10.00	
Editorial and Secretarial Work	535.81	
Promotional Supplies	62.50	
Stamps and Mailing	176.87	
Refunds—Books	8.40	
Printing—Art Work	15.00	
Transfers to Entomological Society of America	700.00	
TOTAL DISBURSEMENTS		**1,508.58**
BANK BALANCE, OCTOBER 31, 1959		**$ 71.70**

NOTE: The comments form an integral part of this statement.

The above statement was prepared from information furnished without independent verification by me because of geographical distribution of original records. Therefore, no opinion can be expressed either as to its accuracy or to the consistency with which generally accepted accounting principles were applied.

EXHIBIT "D"

ENTOMOLOGICAL SOCIETY OF AMERICA

THOMAS SAY FOUNDATION

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1959

BALANCE NOVEMBER 1, 1958		**$ 3,572.00**
RECEIPTS		
Sales of Books	$ 414.47	
Interest	131.42	
TOTAL RECEIPTS		**545.89**
TOTAL TO BE ACCOUNTED FOR		**4,117.89**
DISBURSEMENTS		
None		
BALANCE OCTOBER 31, 1959		**$ 4,117.89**
ABOVE BALANCE ACCOUNTED FOR AS FOLLOWS:		
Savings Account—Guardian Federal Savings and Loan Association		**$ 4,117.89**

NOTE: The comments form an integral part of this statement.

MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA

February 1960 saw the appearance of Volume 1, Number 2 of this new, irregularly appearing periodical. Members subscriptions are $6.00 per volume and non-members $10.00 per volume. Number 2 contains but one paper, *Phylogenetic-Systematic Study of Larval Oedemeridae (Coleoptera)* by Jerome G. Rozen, Jr. The price of a copy of this number is $2.50 postpaid. We are proud to note this well written issue.

REPORTS OF STANDING COMMITTEES FOR 1959

REPORT OF THE PROGRAM COMMITTEE

The 1959 meeting of the Entomological Society of America marked the first joint meeting with the Entomological Society of Ontario and the Entomological Society of Canada. The participation of the three societies required some modification in the usual procedure followed in program planning in order to insure an integrated effort and to accommodate an expanded program.

A. *Organization.* In order to coordinate program planning for the joint meeting, the Entomological Society of Canada appointed co-chairmen at the general program committee level and the section level. This arrangement was successful in unifying the effort at both levels and in the course of these deliberations a splendid rapport was developed.

The Chairman of the *Program Committee* wishes to express his special appreciation to his counterpart, Dr. B. N. Smallman, whose close collaboration and support in all phases of the work proved invaluable.

This experience in teamwork pointed up the unsatisfactory arrangement which normally exists with respect to organization of the program committee.

Although the program committee is composed of three members, the responsibility for program planning and development falls almost entirely on one individual, the committee chairman. This individual is generally widely separated from his predecessor whose previous experience is not brought to bear.

The geographic isolation of the members of the program committee stems from the desire to select a chairman residing in the general area in which the annual meeting is to be held. The advantage of being near the convention city hardly outweighs the disadvantage of isolation from other committee members whose active participation is needed.

B. *Innovations.* Several innovations were tried in the belief that some experimentation is needed to overcome the growing problems facing expanding professional societies in the conduct of their annual meeting.

The call for papers was included as a tear sheet in the June Bulletin together with pertinent information pertaining to the forthcoming meeting. This plan avoided the expense of a separate mailing and placed the form on file where it could be readily located when needed.

The standard format of the printed program was changed to show all concurrent sessions in a single column across the page. While this arrangement required additional pages, it increased the usefulness of the program as a ready reference.

A theme was adopted for the meeting to highlight a significant trend in current thought which was featured in plenary session. By coincidence, the subject of the memorial address supplemented the theme selected for the plenary sessions. As this is unlikely to occur each year, the adoption of a theme may detract from the subject of the memorial lecture. The policy bearing on the relationship of the memorial lecture to the overall program is in need of clarification.

A standard procedure was adopted for timing all concurrent sessions. This plan was announced to moderators in advance of the meeting, reviewed with them just prior to the meetings, and explained to the membership at the opening session. The results of this preliminary effort were gratifying and it is felt that the plan would gain even greater support if consistently followed.

A floor plan of the hotel meeting rooms and a sketch map of the city were included in the printed program.

The index of authors was expanded to include junior authors.

C. *Size and Composition of the Program.* The size of the program in comparison with that of 1958 is shown in Table 1. The 21% increase in the number of papers is in keeping with the growth over the past several years. Considering the central location of the convention city and participation with the Canadian societies, this growth is considered modest.

A sharp increase in submitted papers occurred in the three heaviest sections (B, Cd, F). If this trend continues, further sub-division within individual sections will be required to schedule these papers in the time allotted. To accommodate the 1959 program required up to 8 concurrent sessions and further sub-division seems undesirable. As accelerated growth in certain sections, particularly Insect Physiology and Toxicology, is likely to continue, it seems desirable to take this problem under consideration before the situation becomes more acute.

The statistics on size and content of past programs, while available from old copies of the program, have not been compiled, making it difficult to establish trends which would influence future planning. Programming is becoming increasingly difficult, due to the diversity and growth of professional entomology coupled with a reluctance to extend the annual meeting beyond four days. In view of these considerations, it would seem desirable to adopt a standard format for reporting statistical data pertaining to program size, content and participation and to compile similar data covering meetings over the past decade or more.

D. *Guest Speakers.* To underline the central theme of the meeting, Dr. Jaroslav Weiser, Director, Lab. of Insect Pathology, Institute of Biology, Academy of Sciences, Prague, Czechoslovakia, was invited as a guest speaker. The participation of this outstanding authority from eastern Europe was made possible by a travel grant from the Rockefeller Foundation. The committee wishes to express its appreciation to the Rockefeller Foundation for this support.

E. *Schedule of Program Preparation.* Of 273 submitted papers, 217 had been received by the September 1 deadline. The remaining 56 papers accumulated over a period of several weeks. While the *Program Committee* felt no responsibility in accepting late papers, all were finally included, some being added to page proof. It is important that no obligation be imposed upon the Program Committee to accept late papers.

The desirability of having the printed program in the hands of members well in advance of the meeting is recognized by all concerned, and the *Program Committee*, Executive Secretary and others are seeking solutions to this long-standing problem.

The date of receipt of programs by the members has been based on the following:

1. Starting date established by the deadline for accepting titles (Sept. 1).
2. Time required by the *Program Committee* in editing, assembling and typing.
3. Time required by the Executive Secretary in editing.
4. Printing time. This includes reading of galley, making corrections, etc.
5. Delivery time.

Of these factors, some control can be exercised over all but the last. Slow mail service, particularly during the Thanksgiving holiday, must be accepted as normal. Based on past experience, two weeks might be allowed for delivery.

The *Program Committee* required 18 days for processing the program in 1959. This period could have conveniently been reduced to 14 days or less had the Co-Chairmen been able to commence on the deadline date as would normally be the case.

The Executive Secretary's time was kept to a minimum and was not a factor requiring consideration. Printing

Table 1. Composition of Program of Entomological Society of America, 1958–1959

	Invited speakers		Symposia papers		Submitted papers	
	1958	*1959*	*1958*	*1959*	*1958*	*1959*
PLENARY PROGRAM	7	4	—	6	—	—
SECTION PROGRAM						
A. General Entomology	—	—	9	8	16	20
Ab. Teaching	—	—	7	5	2	—
B. Insect Physiology and Toxicology	—	—	—	10	30	58
C. Insect Biology	—	—	—	—	—	—
Ca. Biological Control	—	—	5	4	27	17
Cb. Apiculture	—	—	7	7	11	2
Cc. Insect Vectors of Plant Diseases	—	2	—	2	10	13
Cd. Ecology and Bionomics	—	3	—	—	42	64
D. Medical and Veterinary Entomology	2	4	5	8	44	41
E. Control, Extension and Regulatory Entomology	—	—	6	6	—	—
Ea. Extension	—	—	18	12	—	—
Eb. Plant Pest Control and Quarantine	—	5	5	—	3	—
F. Chemical Control Investigations	1	1	—	4	43	58
TOTAL	**10**	**19**	**62**	**72**	**228**	**273**

Total papers: 1958—300
1959—364
Increase in 1959—21%

time required approximately two months. Limited inquiry by the committee suggests that this could be appreciably reduced. It is suggested, therefore, that this matter be carefully reviewed to avoid a repetition of this delay in the preparation of the 1960 program. As a guide, the *Program Committee* proposes the following time schedule for use in preparing the 1960 program:

Completion of preparation by Program Committee following deadline	2 weeks
Completion of printing	6 weeks
Completion of delivery	2 weeks
Total time after deadline	10 weeks

F. *Recommendations.* Based on the above comments, the *Program Committee* Chairman respectfully submits the following recommendations which are concurred in by the Co-Chairman, Ent. Society of Canada:

1. That the *Program Committee* be reorganized to provide
   a. active participation by more than one member of the committee.
   b. an overlapping of duties to insure continuity.
2. That a standard format be adopted for recording statistical information on the size and composition of the program and participation by the membership.
3. That the problem of providing printed programs to the membership well in advance of the annual meeting be taken under study immediately in order to evolve a solution before 1960.

The *Program Committee* wishes to express its appreciation to the Executive Secretary, Section Co-Chairmen and members of the *Local Arrangements Committee* for their fine support in the preparation of the Program.

Respectfully submitted,

L. D. Anderson
R. W. Sherman
E. H. Smith, *Chairman*

Governing Board Action

The report was accepted by the Board with appreciation for the new program format and for successfully integrating the papers of the three Societies. No formal action was taken on recommendations 1 and 2. In connection with recommendation 3 the Board voted to change the deadline for receipt of titles and abstracts from September 1 to August 15 effective in 1960. No other changes were made in the Program Policies as adopted by the 1958 Board and printed on page 23 of the March 1959 Bulletin.

REPORT OF THE MEMBERSHIP COMMITTEE

The *Membership Committee* has attempted to solicit every eligible person in the country who should be, but was not, a member of the Society. Only those people who had an active and continuing interest in entomology were solicited.

The committee has synchronized its efforts insofar as feasible with those of the branch committees. This plan appears to have worked well this year. It is our belief that, wherever possible, the branch representatives on the National Committee should be the chairmen of the branch membership committees. We recommend that the Society establish this plan as standard procedure.

The Executive Secretary provided the committee with a list of delinquent members in the late summer. An effort was made through the branch committees to have the delinquent memberships renewed. It is the belief of the committee that personal contacts by friends of delinquent members will normally result in renewed membership and interest in the Society.

Sincere appreciation is expressed to all members of the Society who have worked so diligently on membership during the year.

During 1959, 331 new members were added to the Society during the year.

Respectfully submitted,

J. M. Grayson
A. C. Gunter
H. O. Lund
Roy W. Rings
L. A. Carruth
W. G. Eden, *Chairman*

Governing Board Action

The Board accepted the report and unanimously confirmed the election of the 331 new members.

REPORT OF THE COMMITTEE ON ENTOMOLOGICAL NOMENCLATURE

The *Committee on Entomological Nomenclature* has little to report for 1959. One of its members, C. W. Sabrosky,

was very active in his capacity as American representative (with N. R. Stoll) on the Committee to prepare the London draft of the International Code for publication. A "final" text was prepared at a meeting in London in May-June, 1959, and should be published in the not too distant future.

Your committee has noted a little improvement in the international organization of nomenclature. In a note from the International Commission dated August 12 the Honorary Secretary, N. D. Riley, reports that the Office of Commission has been moved to the British Museum (Natural History).

Routine business of the Committee included several personal letters on nomenclature that required no committee action and one question raised by C. E. Mickel, on Wednesday Evening, December 3, 1958, in the Pioneer Room of the Hotel Utah, Salt Lake City. After a full discussion, the Committee decided that it had no authority to deal with the question raised by Dr. Mickel.

Respectfully submitted,

C. W. Sabrosky
G. P. Holland
D. E. Hardy
R. M. Bohart
C. B. Philip
J. L. Lafoon
H. K. Townes
J. A. Slater
R. L. Usinger, *Chairman*

Governing Board Action

The report was accepted by the Board.

REPORT OF THE COMMITTEE ON COMMON NAMES OF INSECTS

Two ballots on common names were considered by the committee during 1959. The first of these dealt with objections to 21 of the 58 proposed additions and changes published in the December, 1957, Bulletin. The Committee gave final approval to four of the 21 names to which members had objected. A list of the 41 new official names will appear in the Bulletin. The second ballot included proposals to drop eight present common names in favor of new names, to drop two species completely, and to add one species to the list. Six proposals to drop present names for new names were rejected; the other proposals were approved. A list of the committee-approved proposals will be published in the Bulletin.

Many proposals are still awaiting committee action. Much has been done in 1959 to document these proposals so that the 1960 committee should be able to ballot on numerous proposals early in the year. Most of the backlog of work can probably be handled in 1960 and it should be possible to present a new edition of the official list in the December, 1960, Bulletin.

Respectfully submitted,

W. J. Brown
Howard E. Evans
F. P. Keen
L. C. Kuitert
Floyd D. Miner
A. V. Mitchener
Reece I. Sailer
Lloyd O. Warren
Jean L. Laffoon, *Chairman*

Governing Board Action

The report was accepted by the Board.

REPORT OF THE COMMITTEE ON INSECTICIDE TERMINOLOGY

At the 1958 annual meeting of the Society the Governing Board passed the following motion: "Until common names of chemical compounds are available to the editors of Society publications, they shall use their well-known editorial prerogatives as to designations employed in Society publications, provided compounds are identified by proper chemical names and the general courtesies of trademarked designations are exercised." In accordance with this action the Committee on Insecticide Terminology prepared a revised list of approved common names, which was published on pp. 361–362 of the April 1959 issue of the Journal of Economic Entomology, vol. 52, No. 2. Trademarks, which appeared as approved names in previous lists, were not included, with the exception of "D-D", which was included through error.

A statement deleting "D-D" from the list, and adding three new common names was submitted for publication in the October 1959 issue of the Journal of Economic Entomology. Two of the new names, *chlorbenside* and *phorate*, were approved by the Committee on the basis of their acceptance by ASA Committee K-62 as American Standard common names. The third, *medlure*, was approved by the Committee at the request of representatives of the agency that developed the compound, the Plant Pest Control Branch, Entomology Research Division, Agr. Res. Serv., U. S. D. A.

A revised list of common names will be published in 1960, including any new names approved in the interim. It will also include common names of fungicides, herbicides, rodenticides, and other pest control chemicals approved by ASA K-62.

Respectfully submitted,

Thomas G. Bowery
Stanley A. Hall
William M. Hoskins
Ralph B. March
B. N. Smallman
Carroll N. Smith, *Chairman*

Governing Board Action

The report was accepted by the Board.

REPORT OF THE COMMITTEE ON INSECTICIDE REFERENCE STANDARDS

During the year, the Committee made necessary arrangements with manufacturers to supply our distributor, Nutritional Biochemicals Corp., with the following insecticides

Aldrin	10 lbs.	Shell Chemical Corp.
p,p'-DDT	5	Geigy Agricultural Chemicals Division
Dieldrin	10	Shell Chemical Corp.
Heptachlor	10	Velsicol Chemical Corp.
Methyl Parathion	8	Monsanto Chemical Corp.
Phosdrin	10	Shell Chemical Corp.
Strobane	10	Heyden-Newport Chemical Corp.
Toxaphene	10	Hercules Powder Co.

It is estimated that these quantities are sufficient to meet requirements for a year. On the basis of requests for resupply, demand for Standards increased materially during 1959.

The Committee wishes to publicly thank these manufacturers for their continued cooperation and for supplying the Standards *gratis*.

Respectively submitted,

John E. Casida
Lynn H. Dawsey
Rosemarie von Rümker
George F. Ludvik, *Chairman*

Governing Board Action

The report was accepted by the Board.

REPORT OF THE COMMITTEE ON INSECT SURVEYS

The Committee met in the Henry Grady Hotel, Atlanta, Georgia, May 19 and 20. The agenda covered sixteen

topics previously submitted. A field trip was also included in the Committee's work which gave the members an opportunity to observe progress being made in the Imported Fire Ant Eradication Program. The following recommendations were agreed upon by vote of those present and are submitted to the Society for approval:

1. The Committee, at its meeting in Denver, Colorado on April 22–24, 1958, adopted a resolution which was submitted to the Society to the effect that a member of the Armed Forces be added to the Committee membership. The Society failed to take action on this resolution, and the Committee again submits it for approval as follows:

> "2. *Whereas* the entomological activities and problems of the Armed Forces are extensive and diverse, the extent of international movement of equipment and materials offers opportunities for the introduction of exotic insect pests and vectors into this country, and valuable contributions may be made to the Cooperative Insect Survey by entomologists of the Armed Forces, especially in the detection of newly introduced pests, the Committee recommends that the Society increase the membership of the Committee on Insect Surveys to include a representative of the U. S. Department of Defense. In the opinion of the Committee, the individual occupying the position of Secretary of the Armed Forces Pest Control Board could serve most effectively in this capacity."

2. One of the aftermaths of the intensified interest in insect survey and detection has been the enormous increase in the number of insects sent to the Federal taxonomists for identification. The volume has increased to the extent that great difficulty is now being encountered in keeping abreast of the work with the present roster of Federal taxonomists. In order to alleviate this situation the Committee recommends that the heads of the Survey and Detection Operations and Insect Identifications, Parasite Introduction and Research Branch of the Agricultural Research Service, (1) contact recognized taxonomists and attempt to secure agreements from them to accept specimens for identification and (2) to publish and circularize a list of those specialists who are willing to assist in this worthwhile undertaking. The Committee recognizes that the above recommendations are only palliatives and that positive steps should be taken by the Society to secure proper financial support for an adequate staff of Federal insect taxonomists. The Committee further recommends that the Society lead the way in pointing out to administrators of educational institutions the urgent need for insect taxonomists on the staffs of entomology departments, and also allocation of adequate time for such specialists to perform desirable insect identifications.

3. The need for a uniform method of determining and reporting losses attributable to insects on a nation-wide basis is generally recognized. The yardsticks heretofore used by different reporting agencies, however, frequently have had only one common denominator, i.e., lack of uniformity. A detailed study of this problem has been made by the Survey and Detection Operations of the Plant Pest Control Division. That organization has devised forms which appear to be adaptable on a national basis for assembling data and reporting losses attributable to insects. The Committee recommends that the Society sponsor and urge its membership to adopt such uniform methods of compiling the statement of losses attributable to insects, and that it urge all reporting agencies, whether or not served by survey entomologists, to cooperate.

4. The Committee is in agreement that a successful nation-wide insect survey and detection program must include (1) the general adoption of uniform methods of making and reporting survey results, and (2) the proper labeling and submission of insects collected for identification. The committee also believes that to achieve the greatest national value, survey emphasis should be placed upon the search for and early discovery of insects new to the area and nation. The Committee is aware that the above objectives cannot readily be obtained with personnel untrained in survey techniques. Therefore, the Committee recognizing the acute need for intensified training in survey techniques, urges the Survey and Detection Operations of the Plant Pest Control Division, Agricultural Research Service and Cooperating Agencies to take appropriate action to establish and hold survey training courses throughout the nation to further the cause of survey and detection and promote proper reporting on results of such activities.

5. The Committee recognizes that forest insect survey and detection present problems peculiar to large forest areas not generally encountered in many states. The Committee also appreciates the value of the surveys being conducted by the Forest Service and wishes to commend it for the thoroughness of its work and the publishing of its findings in its annual reports. It is recommended, however, that the Forest Service explore the possibility of increasing the usefulness and timely interest of its surveys by submitting items of current findings for publication in the Cooperative Economic Insect Report.

6. The Committee unanimously agreed that the *Committee on Insect Surveys* be continued.

7. The Committee submitted a list of names for consideration in replacing members whose terms would expire at the end of the 1959 annual meeting of the Society. The Committee moved the adoption and proper channeling of these recommendations through the office of the Executive Secretary, Entomological Society of America.

8. W. H. Anderson attended the Atlanta meeting for P. W. Oman. Guests present were E. D. Burgess, Joe Gentry, W. C. Johnson, R. G. Oakley, C. M. Baker and W. E. Blasingame.

Respectfully submitted,

E. W. Beck
O. H. Hammer
J. N. Roney
R. L. Furniss
N. O. Berry
L. D. Newsom
K. D. Quarterman
C. A. Bower, *Chairman*
Kelvin Dorward, *Ex Officio*
P. W. Oman, *Ex Officio*

Governing Board Action

The report was accepted by the Board.

In connection with the resolution in item 1 of the report the Board voted to recommend to the membership at the final business meeting that the title of this standing committee be changed to the *Committee on Insect Surveys and Losses* and that the individual who is Executive Secretary of the Armed Forces Pest Control Board be included as a member of the committee *ex officio*.

See also Board action noted at the end of the report of the *Committee on Losses Caused by Insects* and of the report of the *Committee to Review the Committee Structure of the Society*.

REPORT OF THE COMMITTEE ON FINANCE

Recommendation

It is proposed that the Society send a letter to the Membership and Sustaining Associates asking for a donation to the Building Fund or for the purchase of equipment in the Headquarters Office.

Contribution to Building Fund or Equipment for Office

It is proposed that a letter be sent to the Membership giving them an opportunity to make a donation to the Building Fund for a permanent home or to purchase

equipment such as desks, files, pictures, etc., for the Headquarters Office. If desired, recognition of such gifts may be given.

The letter to the Membership seeking donations would indicate that the Society has gone into debt to purchase the new quarters and that we are trying this method of raising funds rather than increasing dues. It might be well to give the extent of the indebtedness.

It is suggested that the letter to Sustaining Associates give several options for their consideration as to the use of their contribution, such as Building Fund, Operation of Building or Equipment for the office.

The letter should further mention that contributions are deductible from Federal Income Tax since the Entomological Society of America is recognized as a non-profit scientific organization by the U. S. Bureau of Internal Revenue.

Respectfully submitted;

JOHN V. OSMUN
S. E. JONES
J. EVERETT BUSSART, *Chairman*

Governing Board Action

The Board accepted the report. Although committee member J. V. Osmun was not in agreement with the recommendation it was adopted and the Executive Secretary directed to prepare such a letter or letters in 1960.

REPORT OF THE COMMITTEE ON PROFESSIONAL TRAINING, STANDARDS AND STATUS

Following the recommendation of the 1958 Committee, this year's Committee has concentrated its attention on the status and trends in entomological training.

Our basic problem was to determine: (1) where entomological training was available; (2) the numbers involved; and (3) what institutional philosophy was followed in the various curricula.

A list of institutions engaged in this work was not available except Circular 570 of the Office of Education of the Department of Health, Education and Welfare which announced the degrees conferred in 1957-58. This listed 43 institutions that conferred 85 bachelor's degrees, 108 master's degrees and 83 doctorates in entomology.

In attempting to make this list more complete, we wrote to all the land-grant colleges and included a list of all four-year accredited institutions in their state and requested that they indicate which institutions in their state offered an undergraduate major in entomology. This resulted in a total of 72 institutions that were requested to submit a questionnaire. When these were returned it was determined that only 39 actually offered a curriculum leading to a bachelor's degree in entomology.

Several institutions not included in the 39 mentioned above indicated that their students who were interested in entomological careers were referred to other majors such as biology, zoology or even plant pathology. Included in the 39 were 11 that indicated that a student could choose a program with a major in entomology in two different colleges of the same institution with different requirements.

Some of these items are summarized in the attached table. The summarization is the biggest single feat of the Committee as there was not a single duplication of material among the questionnaires submitted except those of the Berkeley and Davis campuses of the University of California. To accomplish this tabulation some arbitrary decisions were made that have very possibly resulted in erroneous interpretations. Several years ago Roger C. Smith, from a study of catalogues, published a list of institutions that offered one or more courses with an entomological title but this is the first attempt as far as the Committee is aware to list the institutions that offered organized majors leading to a bachelor's degree in entomology.

This survey was directed toward information on undergraduate training. It was thought wise to incorporate some questions on graduate programs in order to interpret better the reasons lying behind the undergraduate curricula. Data are included in the table for informational purposes as to whether the institutions listed offer graduate work or not. This list should not be interpreted as all-inclusive as many institutions that were not canvassed as possibly offering undergraduate majors do train graduate students in entomology in allied biological fields.

A recent study of graduate fellowships awarded in entomology through the National Institutes of Health indicates that of a total of 16 grants, 6 were awarded to students working on very definitely entomological thesis problems in institutions that offered no organized undergraduate majors in entomology. Of these 6, two had no undergraduate training in entomology, two had one course, one had two courses and the sixth has transferred his field. Although the numbers are small, this may have considerable significance concerning training as these fellows are carefully screened and represent some of the best brains in their generations.

It is unfortunate that we have no compilation of the unit requirements in entomology for a major that dates back to the late '20's or early '30's in order to substantiate the belief of the Committee that the requirements in entomology courses have been reduced markedly. The average for all curricula studied was 19 units of entomology, 9 units of English, 7 units of botany, 6 units of mathematics, 6 units of physics, 6 units of history and political science and 5 units of economics. Bacteriology and plant pathology average 4 and 3 units respectively.

On the whole the results are very reassuring to the school of thought that believes that the undergraduate offerings in entomology should not be stressed at the expense of basic sciences and liberal arts. The concentration is very close to the average of 19 semester units of entomology with a maximum of 30 units in only three schools and a minimum of 3 units in one.

The Chairman would be very grateful for additions or corrections to the report which can be forwarded to him at University of California, Davis in order to expedite the work of the Committee.

Respectfully submitted,

JOHN T. CREIGHTON
RALPH E. HEAL
KENNETH L. KNIGHT
DALE R. LINDSAY
CHARLES E. PALM
STANLEY B. FREEBORN, *Chairman*

Governing Board Action

The report was accepted by the Board. The Board recommended to the Committee that it;

1. Consider and cooperate with similar studies being made by other biological groups such as the Biological Sciences Curriculum Study of the A. I. B. S.
2. Investigate means of making a more intensive survey of entomological training or of other matters related to improving entomological standards and status by a grant-supported study.

State and Institutions	Undergraduate Curriculum Named Entomology	Entomology Offered in Two Fields	Entomology Majors Referred to Other Fields	Number of Undergraduate Majors	Number of B.S. Degrees *1957–58*	Offers Graduate Work *1957–58*	
						M.S.	Ph.D.
ALABAMA—							
Alabama Polytechnic Institute	—	—	Zoological Sci	—	3	yes	yes
University of Alabama[2]	—	—	—	—	—	yes	yes
ALASKA—							
University of Alaska	—	—	—	—	—	—	—
ARIZONA—							
University of Arizona	yes	Agri, L. A.	—	12	4	yes	—
Arizona State University[2]	yes	—	—	10	3	yes	—
ARKANSAS—							
University of Arkansas	yes	—	—	—	4	yes	—
CALIFORNIA—							
University of California (Berkeley & Davis)	yes	—	—	52	12	yes	yes
San Jose State College[2]	yes	—	—	19	5	yes	—
Stanford University[2]	—	—	—	—	—	—	—
COLORADO—							
Colorado State University	yes	—	—	15	6	yes	—
CONNECTICUT—							
University of Connecticut	—	—	Zoology	5	4	yes	yes
Yale University[2]	—	—	Zoology	—	—	yes	yes
DELAWARE—							
University of Delaware	yes	—	—	7	2	yes	—
FLORIDA—							
University of Florida	yes	Curriculum A, B	—	33	17	yes	yes
GEORGIA—							
University of Georgia	yes	Agri, Arts & Sci	—	26	6	no[1]	—
HAWAII—							
University of Hawaii	—	—	Zoology	8	3	yes	yes
IDAHO—							
University of Idaho	yes	—	—	2	1	yes	no[1]
ILLINOIS—							
University of Illinois	—	—	—	—	—	yes	yes
Northwestern University[2]	—	—	Biology	—	—	yes	yes
INDIANA—							
Purdue University	yes	—	—	18	5	yes	yes
IOWA—							
Iowa State College	yes	—	—	6	3	yes	yes
Iowa Wesleyan[2]	—	—	Biology	6	2	—	—
KANSAS—							
Kansas State University	yes	Agri, Arts & Sci	—	7	2	yes	yes
University of Kansas[2]	yes	—	—	6	5	yes	yes
KENTUCKY—							
University of Kentucky	—	—	—	—	—	—	—
LOUISIANA—							
Louisiana State University	yes	Agri, Arts & Sci	—	5	—	yes	yes
Louisiana Polytechnic Institute[2]	—	—	Biology	—	—	yes	—
Tulane University[2]	—	—	—	—	—	yes	yes
MAINE—							
University of Maine	yes	—	—	4	2	yes	—
MARYLAND—							
University of Maryland	yes	—	—	18	3	yes	yes
MASSACHUSETTS—							
University of Massachusetts	yes	—	—	4	5	yes	yes
Boston University[2]	—	—	Biology	—	—	yes	yes
MICHIGAN—							
Michigan State University	yes	—	—	—	2	yes	yes
University of Michigan[2]	—	—	Zoology	—	—	yes	yes
MINNESOTA—							
University of Minnesota	yes	Agri, S. L. A.	—	6	1	yes	yes
MISSISSIPPI—							
Mississippi State University	—	—	Zoology	10	6	yes	yes
MISSOURI—							
University of Missouri	yes	—	—	9	3	yes	yes

[1] Now given
[2] Non Land-Grant Institution

State and Institutions	Undergraduate Curriculum Named Entomology	Entomology Offered in Two Fields	Entomology Majors Referred to Other Fields	Number of Undergraduate Majors	Number of B.S. Degrees *1957–58*	Offers Graduate Work *1957–58*	
						M.S.	Ph.D.
MONTANA—							
Montana State College	yes	—	—	5	2	yes	yes
NEBRASKA—							
University of Nebraska	yes	Agri, Arts & Sci	—	3	1	yes	yes
NEVADA—							
University of Nevada	—	—	—	—	—	—	—
NEW HAMPSHIRE—							
University of New Hampshire	yes	Agri, L. A.	—	1	1	yes	—
NEW JERSEY—							
Rutgers University	yes	—	—	8	3	yes	yes
NEW MEXICO—							
New Mexico State University	—	—	Biology	3	3	yes	—
NEW YORK—							
Cornell University	yes	—	—	19	5	yes	yes
Fordham University[2]	—	—	Biology	—	—	yes	yes
Syracuse University[2]	yes	—	—	8	6	yes	yes
University of Buffalo[2]	—	—	Biology	—	—	—	—
NORTH CAROLINA—							
North Carolina State College	yes	—	—	3	1	yes	yes
NORTH DAKOTA—							
N. Dakota Agricultural College	yes	Agri, Arts & Sci	—	6	2	yes	no[1]
OHIO—							
Ohio State University	yes	—	—	11	1	yes	yes
OKLAHOMA—							
Oklahoma State University	yes	—	—	21	10	yes	yes
OREGON—							
Oregon State College	yes	—	—	6	2	yes	yes
PENNSYLVANIA—							
Pennsylvania State University	—	—	Zoology	5	2	yes	yes
RHODE ISLAND—							
University of Rhode Island	—	—	Biology-Zoology	—	—	yes	no[1]
SOUTH CAROLINA—							
Clemson Agricultural College	yes	—	—	9	4	yes	yes
SOUTH DAKOTA—							
South Dakota State College	yes	Agri, Arts & Sci	—	2	1	yes	no[1]
TENNESSEE—							
University of Tennessee	yes	—	—	2	1	yes	yes
TEXAS—							
Agricultural and Mechanical College of Texas	yes	Agri, Arts & Sci	—	30	14	yes	yes
Texas Technological College[2]	yes	—	—	15	—	yes	—
UTAH—							
Utah State University	yes	Agri, Arts & Sci	—	9	4	yes	yes
Brigham Young University[2]	—	—	Zoology	13	5	yes	—
University of Utah[2]	—	—	Zoology	6	—	yes	yes
VERMONT—							
University of Vermont	—	—	—	—	—	—	—
VIRGINIA—							
Virginia Polytechnic Institute	—	—	Biology	2	1	yes	yes
WASHINGTON—							
Washington State University	yes	Agri, Arts & Sci	—	6	5	yes	yes
University of Washington	—	—	Zoology	—	—	—	—
WEST VIRGINIA—							
West Virginia University	—	—	—	—	—	yes	—
WISCONSIN—							
University of Wisconsin	yes	—	—	3	1	yes	yes
WYOMING—							
University of Wyoming	—	—	Zoology	6	2	yes	yes

[1] Now given
[2] Non Land-Grant Institution

REPORTS OF REPRESENTATIVES TO SCIENTIFIC BODIES FOR 1959

REPORT OF REPRESENTATIVE TO THE AMERICAN GRASSLAND COUNCIL

The first annual business meeting of the American Grassland Council under the new constitution adopted in June 1958 was held at Chicago, Illinois on November 28, 1958. At this meeting Dr. John B. Washko of Pennsylvania State University was elected president for the coming year. Also at this meeting the initiation of a grassland publication to be issued quarterly was authorized.

The first issue of this quarterly called "Grassland Progress" appeared in September 1959. The purpose of the publication is to present in brief form the broad panorama of grassland progress, notices of meetings, publication of books, research reports, and successful application of research developments. The Entomological Society of America representative was asked to serve on the editorial board.

The annual meeting of the Council was held on January 27–28, 1959 in conjunction with the meeting of the American Society of Range Management at Tulsa, Oklahoma. An address, "The Importance of Grasslands in our National Life," was presented by H. B. Sprague, former president of the American Grassland Council. Nine papers on the various phases of grasslands as related to range management were presented at two paper reading sessions sponsored by the Council.

The 1960 annual meeting will be held in conjunction with the summer meeting of the Agricultural Engineers at Columbus, Ohio.

Respectfully submitted,

B. A. App
E. S. A. Representative

Governing Board Action

The report was accepted by the Board.

REPORT OF REPRESENTATIVE AAAS-CAMPBELL AWARD FOR VEGETABLE RESEARCH

Your representative served on the panel of seven judges who selected, from a field of 8 nominations, a contribution to basic research on a virus disease of sweet corn, to receive the second annual AAAS-Campbell Award for Vegetable Research. The award, consisting of $1,500 and a bronze medal, was presented during the annual meetings of the American Association for the Advancement of Science at Washington, D. C., on December 30, 1958, to Dr. Karl Maramorosch of the Rockefeller Institute for Medical Research, New York. The specific published paper on which the award to Dr. Maramorosch, a member of this Society, was based was entitled "Cross protection between two strains of corn stunt virus in an insect vector." Further details regarding the granting of this award appeared on page 52 of the Bulletin, Vol. 5, No. 1, March 1959.

I have continued to serve as representative of the Entomological Society of America on the Award Committee for the current year.

Respectfully submitted,

G. J. Haeussler
E. S. A. Representative

Governing Board Action

The report was accepted by the Board.

REPORT OF THE REPRESENTATIVE TO THE DIVISION OF BIOLOGY AND AGRICULTURE, NATIONAL RESEARCH COUNCIL

The Annual Meeting of the Division was held March 20, 1959, in the conference room of the American Council on Education at 1758 Massachusetts Avenue, N.W., Washington, D. C. It was held as part of the second annual meeting of the National Research Council, which extended from March 19 to 21. There are 57 members of the Division, and 51 of them attended the meeting.

Our former, able representative to the Division, A. B. Gurney, reviewed its functions, and the responsibilities of the representative of our society, in his report for 1956 (Bull. ESA, 3:1, p. 20, 1957). Obviously it is desirable to explain the history, relationships and accomplishments of the NAS-NRC and the Division of Biology and Agriculture periodically, and at the meeting here reported, H. Burr Steinbach, Chairman, did so. Among other pertinent comments, Dr. Steinbach remarked on the traditional role of NAS-NRC as a source of scientific advice for government. With the current explosive growth of science, NAS-NRC is not the only source of such advice. Therefore the Division, and through it societies such as our own, must determine the role to be played in scientific progress, both national and international. Recommendations and suggestions which will lead to more effective participation in such an aggressive program will be welcomed by your representative.

In general the meeting of the Division had two principal purposes, (1) to give the members information that they had not already received about the Division and (2) to provide opportunity for the members to be heard on any subject pertinent to the work of the Division.

Many of the committees of the Division were active during the year. One committee, the activities of which are of interest to those entomologists who are concerned with estimates of losses caused by insects, is the Committee on Agricultural Pests. This committee received a grant of $9,500 from the Rockefeller Foundation to support its work on the analysis, development and promotion of use of methods for the estimation of losses caused by agricultural pests.

ESA was one of the animal science societies that approved the invitation by NAS-NRC to the International Congress of Zoology to hold its next meeting in the United States, in 1963. An organizing committee for the Congress, which will function under the U. S. National Committee of the International Union of Biological Sciences, has been selected. Curtis W. Sabrosky is the member of the organizing committee from ESA, and he will work with others of the 11-man committee representing various animal science societies.

Respectfully submitted,

William H. Anderson
ESA Representative

Governing Board Action

The report was accepted by the Board.

REPORT OF THE REPRESENTATIVE ON THE GOVERNING BOARD OF THE AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

Recommendations: (1) that the Society continue as a full member of A. I. B. S. and pay membership dues to the Institute at the rate of one dollar per year per individual active member in the United States and Canada because the minimum total of $1000 per annum is no longer permissible; (2) that the Society cooperate as fully as possible in the various programs conducted by A. I. B. S., thereby assuming its proportionate share of the responsibility for such programs as well as deriving as fully as possible the benefits accruing from them.

Your representative attended the two meetings of the Board held in 1959—April 28–29 in Washington, D. C., and August 29 at State College, Pennsylvania. Activities of A. I. B. S. were discussed in the Report of the Committee on Society Membership in the A. I. B. S. (see pp. 26–28 of the March 1958 Bulletin of the Entomological

Society of America) and "A Progress Report" by James G. Dickson, President of A. I. B. S., appeared in the January 1959 *A. I. B. S. Bulletin* which was sent to the active membership of the Entomological Society of America. In order to avoid needless repetition this report will therefore deal briefly with some of the more recent developments mentioned by the Executive Director, Hiden T. Cox, in his last report to the Governing Board of the A. I. B. S.

Note: Under the title, "The AIBS after Ten Years," this report by Dr. Cox was published in the *AIBS Bulletin* 9(5):19–21. November 1959. The details are therefore not re-published here.

At the Annual Meeting of Biological Societies held at the Pennsylvania State University August 30–September 3, 1959, approximately 1,400 papers were given in the sessions of the 17 cooperating societies. Although most of the botanical societies did not participate in this meeting because the Ninth International Botanical Congress was held in Montreal during the preceding week, nevertheless there were 3,188 paid registrations.

Respectfully submitted,

F. W. Poos
ESA Representative

Governing Board Action

The report was accepted by the Board.

REPORT OF THE REPRESENTATIVE TO THE AGRICULTURAL RESEARCH INSTITUTE, NATIONAL RESEARCH COUNCIL

The Agricultural Research Institute is "a supporting organization for the Agricultural Board in promotion of the kinds of research and policies needed to insure the best long-time utilization of agricultural resources for the national welfare." The Board's Committee on Agricultural Pests has six subcommittees, that on insects being presently composed of H. M. Harris (chairman), G. C. Decker, W. E. McCauley, L. D. Newsom, B. B. Pepper and J. H. Pepper. The Committee set up a project on the agricultural losses caused by pests, as an important part of its work. Under the provisions of a grant from The Rockefeller Foundation, some forty members of the Committee and its Subcommittees met in Washington October 20–21, 1958. This meeting stimulated greater interest in the measurement of losses and in the accumulation and publication of data relating to losses. So as to take advantage of the initial impetus on this project an additional grant has been obtained from The Rockefeller Foundation for the period September 1, 1959 to December 31, 1960. This should produce sufficient momentum so that the contemplated program will be self-perpetuated by parallel committees within other agencies. The Entomological Society of America has set up such a committee, the Special Committee on Losses Caused by Insects, which is making itself felt in the achievement of the objectives of the original project.

Respectfully submitted,

Harold H. Shepard
E.S.A. Representative

Governing Board Action

The report was accepted by the Board.

REPORT OF REPRESENTATIVE TO SECOND NATIONAL CONFERENCE ON WORLD HEALTH

This constitutes a brief report to the Society on the above Conference which was sponsored by the National Citizens Committee for the World Health Organization. This meeting was held in Washington, D. C., May 7–9, 1959. It brought together leaders in Congress and the federal government and representatives of voluntary organizations and industrial companies interested in health and international relations. The theme of the Conference was "World Health for World Peace" and its objectives were to discuss international health legislation, to appraise the value of health programs in developing cooperation among nations which could spread over into more controversial fields, and to outline the potentialities for an International Health Year.

Dr. Milton Eisenhower, President, Johns Hopkins University, was the Conference Chairman. He presided at a Key-Note Session on the first day of the Conference which was addressed by Dr. Ernest L. Stebbens, President, National Citizens Committee for the World Health Organization, Hon. Andrew W. Cordier, Executive Assistant to the Secretary-General of the United Nations, Dr. Abraham Horwitz, Director, Pan American Sanitary Bureau, WHO Regional Office for the Americas, Hon. Francis O. Wilcox, Assistant Secretary of State for International Organization Affairs, and Dr. Frank G. Boudreau, President, Milbank Memorial Fund. At dinner and luncheon sessions, of which there were four, inspiring addresses on the general subject of the value of international health activities in promoting world peace were delivered by Dr. Arthur S. Flemming, Secretary of Health, Education, and Welfare, Dr. Leroy E. Burney, Surgeon General, Public Health Service, Senator Hubert H. Humphrey (Minnesota), Congressman Walter H. Judd (Minnesota), Mr. Leo Cherne, Executive Director, Research Institute of America, and Mr. Clark M. Eichelberger, Executive Director, American Association for the United Nations.

A panel session held on the morning of the second day on "World Health for World Peace" had as its Chairman, Dr. Howard A. Rusk, Associate Editor of The New York Times. Panel members included Senator Lister Hill (Alabama), Senator Richard L. Neuberger (Oregon), Congressman Walter H. Judd, Dr. Thomas Parran, President, The Avalon Foundation, Former Surgeon General, Public Health Service, Mr. John T. Conner, President, Merck and Company, Inc., Mr. John J. Powers, President, Pfizer International, Inc., Mr. P. C. Spencer, Chairman of the Board, Sinclair Oil Corporation, and Mr. Leo Cherne. To quote from the Committee Report: "The Panel Session was brilliantly conceived and conducted, informative, and highly stimulating. On the basis of material presented the representatives of various organizations persuaded many of their groups to take positive supporting action for International Health programs."

The afternoon of the second day was devoted to six Forums running simultaneously at which distinguished panelists guided discussions on the following topics: Health and the American Image Abroad; International Health Year; International Health and Medical Research; Health and Economic Development; Training and Exchange Problems; and Health and Population Dynamics. These sessions were well attended and many ideas for promoting world peace by means of health activities were advanced by participants who represented a wide variety of disciplines. Much enthusiasm was expressed at the session on the "International Health Year" for the holding of such an event and a recommendation was passed unanimously urging that the U. S. Delegation to the 12th World Health Assembly support in the Assembly the designation of an International Health Year to start in 1961; also recommended was that the National Citizens Committee for the World Health Organization, the Department of Health, Education, and Welfare, the Congress, and other groups give all possible support to the project. The opinion of the Director-General, WHO, was cited to the effect that the objective of an International Health Year should be "to stimulate primarily on a national basis, the intensification of international cooperation on carefully selected aspects of health and medical research." Activities of this nature appropriately could include a variety of studies on insects of public health importance to advance knowledge on insect distribution and importance and possibilities for control and eradication.

At the closing session Mr. Eichelberger stated that public opinion polls show the people of this country to be 90 percent in favor of the United Nations, and that we should now discuss the issues with them rather than merely work for support which already is strong. Issues referred to included world health, food supply, atoms for peace, reduction of international tensions and establishment of world respect for law.

In the opinion of your representative, it would have been extremely difficult for anyone to attend the sessions of this Conference and not come away imbued with a feeling of the great need for sharing our know-how in medicine and public health with less fortunate countries and of the potentials of these activities for "leading us into a pathway of peace" through bringing about better understandings among nations.

[The proposal for holding an International Health and Medical Year was put on the agenda of the 12th World Health Assembly both by the United States, following a Senate resolution on the subject, and by the United Nations General Assembly. The Health Assembly, while recognizing the importance of such a Year, decided to postpone holding it for the present because of other heavy national and international commitments in health. The matter will be considered further by the 13th World Health Assembly which meets in May 1960.]

Respectfully submitted,
G. H. BRADLEY
ESA Representative

Governing Board Action

The report was accepted by the Board.

REPORT OF THE REPRESENTATIVE TO THE NACA-ESA SYMPOSIUM RESEARCH PROGRESS ON INSECT RESISTANCE

This Symposium, jointly sponsored by the National Agricultural Chemicals Association and the Entomological Society of America, was held at the Mayflower Hotel in Washington, D. C., October 7 and 8, 1959. The official registration at the Symposium was 210. Among these were technical and scientific personnel from federal and state agencies, industry, and recognized research institutions, including the distinguished foreign participants, Dr. Paul Müller, Nobel Laureate; Dr. Hans Gysin, Prof. R. Milani, Dr. George Davidson, Dr. Walter Ripper, and Prof. A. W. A. Brown. The following formal papers were presented:

Greenhouse Mites—*F. F. Smith*

Citrus Mites—*L. R. Jeppson*

Insects and Mites Attacking Orchard Crops—*E. H. Glass*

Insects Attacking Vegetable Crops—*R. K. Chapman*

Impact Upon Use and Development of Insecticides for Cotton Pests—*H. G. Johnston*

Boll Weevil and Results of Surveys—*J. S. Roussel*

Pests of Livestock and Poultry—*W. C. McDuffie*

Cockroaches—*J. M. Grayson*

The Insecticide Resistance Problem in the W.H.O. Programs for Vector Control—*A. W. A. Brown*

Formal Genetics of Insecticide Resistant Strains of Insects—*J. Crow*

Genetical Studies of Insecticide Resistant Insects—*R. Milani*

The Dosage-Mortality Curve as an Indicator of Insecticide Resistance—*W. M. Hoskins*

Test Methods for Establishing Levels of Susceptibility and Detecting the Development of Resistance in Insects of Public Health Importance—*K. D. Quarterman*

Establishing Levels of Insecticide Resistance with Standardized Laboratory Detection Methods in Agricultural Arthropod Pests—*H. T. Reynolds*

Biochemical Aspects of Resistance—*C. W. Kearns*

Biochemical Aspects of Resistance to Chlorinated Hydrocarbon Insecticides—*A. S. Perry*

Biochemical Aspects of Resistance to Organo-Phosphorus Insecticides—*R. B. March*

Insect Resistance to Carbamate Insecticides—*H. H. Moorefield*

Selective Insect Control and Its Application to the Resistance Problem—*W. E. Ripper*

Antibiotic Resistance Problems in Man—*William P. Boger*

Views on Future Research Contributions to a Solution of the Resistance Problem—*E. F. Knipling*

A Member of the Chemical Industry Looks at the Resistance Problem—*J. E. Johnson*

Views on Future Pesticide Research—*G. R. Ferguson.*

The complete papers and the discussion will be published in the Miscellaneous Publications of the E.S.A.

It is considered that the objectives of the Symposium—1) to promote presentation and exchange of information between research scientists and administrators, leading to an increased awareness of the problem and support for expanded research; 2) Promotion of establishment of standard test methods to measure levels of resistance in agricultural insects; 3) Stimulation of basic research in field of insecticide resistance; were very satisfactorily achieved.

In connection with "2" above, the suggestion was repeatedly advanced that the E.S.A. form a committee to consider this matter (along the lines of insecticide reference standards). Members who have indicated a special interest are:

DR. GEORGE LUDVIK—Monsanto Chemical Co., St. Louis

DR. H. T. REYNOLDS—University of California, Riverside

DR. K. D. QUARTERMAN—U.S.P.H.S., Communicable Disease Center, Savannah, Georgia

The pattern of joint NACA-ESA sponsorship of this Symposium was so successful that it was suggested that additional symposiums be considered at intervals, to discuss other mutual problems.

Respectfully submitted,
R. L. METCALF
E. S. A. Representative

Governing Board Action

The report was accepted by the Board. The Executive Secretary was directed to extend a vote of thanks from the Board to the N.A.C.A.

REPORT OF REPRESENTATIVE NATIONAL PEST CONTROL ASSOCIATION PRETREAT BOARD

The PreTreaT Board of the National Pest Control Association did not have its initial meeting in 1959 for two reasons. It has not been possible to complete the membership of the Board, which is to consist of four Association members and three people from interested groups outside of the industry. In addition, favorable developments in a program for insurance backing of termite treatments must be thoroughly investigated before a meeting can be held.

With respect to the membership on the Board, two of the three non-industry groups have accepted invitations to participate. They are the Entomological Society of America and the National Association of Home Builders. (Unfortunately, the representative of the latter has recently passed away.) The National Pest Control Association has made an exhaustive search for another group that has a concern in pre-treatment of structures for

termite prevention, but in its contacts with mortgage bankers, real estate organizations, savings and loan leagues and architect groups, there has been no favorable action. These groups express approval of the objectives of the PreTreaT Board but are not ready at this time to name representatives to it. There is continuing effort, however, being made along these lines.

At the same time, there are some very favorable indications that an insurance plan may be forthcoming from a reliable company which would provide policy protection to home owners and others receiving protective treatment against termite attack. It appears that such an insurance program may be developed in the next few weeks and the basic principles involved will be firmly established. It is my understanding that, at that time, renewed effort will be made to complete the PreTreaT Board and get it into operation.

There seems to be no question but what the PreTreaT Board will become an established section of the NPCA and a favorable insurance plan will permit the Board to operate on a broader base. The Association has expressed sincere appreciation for the continued support of the Entomological Society of America in this endeavor.

Respectfully submitted,

JOHN V. OSMUN
E.S.A. Representative

Governing Board Action

The report was accepted by the Governing Board.

REPORTS OF EDITORIAL BOARDS FOR 1959

REPORT OF THE MANAGING EDITOR

This report deals with only four publications of the Society: The ANNALS, the BULLETIN, the JOURNAL OF ECONOMIC ENTOMOLOGY and the MISCELLANEOUS PUBLICATIONS. As in previous years the financial records are presented in the Executive Secretary's report as required by the Constitution.

Recommendation: It is recommended that consideration be given to the establishment of a Society Committee on Publications with power to act (with Governing Board approval) on all matters of policy concerning Society publications.

The life blood of the Society consists largely of its publications of which there now are several. They contain such a wide variety of material that an overall policy committee is needed. It may be made a standing committee later on if this proves to be advisable. Suggestions for the formation of such a committee will be made if requested.

Increases in Manuscript Material. Of much concern is the rapidly increasing amount of manuscript material now being submitted to the Society for publication, as shown by the following tabulation of the number of pages published since the present formats were adopted:

Years	*1955*	*1956*	*1957*	*1958*	*1959*
ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA					
Pages	528	630	652	614	778
BULLETIN OF THE ENTOMOLOGICAL SOCIETY OF AMERICA					
Pages	120	112	201	136	225*
JOURNAL OF ECONOMIC ENTOMOLOGY					
Pages	801	905	864	947	1200*

* Approximated.

Because publication costs are continuing to rise, it is imperative that authors be required to present their data as concisely as possible; also that improvement in content be encouraged, or possibly required as rapidly as more effective procedures can be established for this purpose.

Circulation Data. These indicate that the Annals has been gaining subscribers each year whereas the Journal has not since 1957.

Year	*Copies Printed*		*Copies Mailed*	
	ANNALS (Sept. issue)	JOURNAL (Oct. issue)	ANNALS	JOURNAL
1956	1900	5400	1624	4927
1957	2100	5700	1842	5271
1958	2200	6000	1929	5269
1959	2400	6000	1984	5258

ANNALS non-member subscribers, 548

JOURNAL non-member subscribers, 1774

Date of Issues: The date each number is issued appears at the bottom of cover II. However, the date of mailing the issue is sometimes a week or 10 days later. Dates of mailing the issues of the current fiscal year, which compare favorably with that of most biological journals, were:

ANNALS	JOURNAL
Nov. (1958)—December 9	Dec. (1958)—January 22
Jan. (1959)—February 3	Feb. (1959)—March 20
March —April 2	April —April 17
May —June 2	June —June 17
July —August 4	August —August 17
September —September 23	October —October 30

Bulletin of the Entomological Society of America. Competition for space in the BULLETIN continues to increase. Funds alloted for publication of the BULLETIN are necessarily limited. Recent issues of the BULLETIN have appeared about as scheduled—except for the September issue (Program Issue) which is delayed even more than usual this year because of the complicated program of the First Joint Meeting of the Entomological Society of Ontario, Entomological Society of Canada, and the Entomological Society of America. The December issue will contain a list of members of the Entomological Society of America.

At the request of the Executive Secretary, who is also Editor of the BULLETIN, a column entitled "From the Managing Editor's Desk" has appeared in each issue during 1959. Comments on the value of this column, especially whether it should be continued in future issues, would be welcomed.

Miscellaneous Publications of the Entomological Society of America. Volume 1 Number 1 (32 pp.) of this new publication appeared October 1, 1959 after much delay in the appointment of the Subject Editor, *and* in the receipt of suitable manuscripts submitted for this publication.

Volume 1 Number 2 is now in press and will be issued before the end of 1959. Several manuscripts are now in the hands of Editor Rozen for possible use in Volume 2 which it is expected will contain approximately 200 pages.

Advertising. Prospects for obtaining any substantial increases in the amount of advertising in the ANNALS, the BULLETIN or the JOURNAL are not encouraging. Other duties did not permit enough time during 1959 to make a serious attempt to obtain additional advertising although about 120 letters were written to prospective advertisers and some soliciting was also done at the exhibits shown at the last annual meetings of the AAAS and the AIBS. The Sustaining Associates program and the advertising in Entoma are factors that make it more difficult to obtain additional advertising in other Society publications.

Reda tory Services. As a member society of the American Institute of Biological Sciences an experiment has been initiated with AIBS by which redactory services for the JOURNAL OF ECONOMIC ENTOMOLOGY have been started as a nucleus around which the Institute is organizing a long-hoped-for central editorial office for handling the mechanical editing of several journals of its member societies. It is expected that, beginning in 1960, the Publications Office of AIBS will assume full responsibility for the mechanical

editing of the Journal. The business management will continue to be handled in the office of the Executive Secretary of the ESA.

Other Services. Since February 15, the editorial assistance of Miss Gladys Visel, formerly with the Smithsonian Institution, has been employed 14 hours per week. Dr. R. H. Foote has been employed to compile the index of the current volume of the JOURNAL OF ECONOMIC ENTOMOLOGY. The extremely helpful assistance of my wife, Edna I. Poos, in handling proof as in previous years, is acknowledged.

Respectfully submitted,

F. W. Poos
Managing Editor

REPORT OF THE EDITORIAL BOARD

ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA

During 1959, 106 papers plus 7 "Scientific Notes" have been published in the ANNALS to a total of 764 pages, as compared with an average of 632 pages per year for the three years preceding. 15 papers were rejected, of which several were accepted by the Journal of Economic Entomology. Manuscripts not requiring too extensive rewriting have been published within 6 or 7 months of receipt, but the present backlog suggests that this may creep up to 8 months. Except for one issue (when flood waters isolated the printing plant in Columbus) each issue has been mailed within the month when it was dated.

The chief activity of the Board has been in connection with the review of manuscripts at the request of the editor. One board member reports reviewing about 15 such manuscripts.

Most of the members of the board feel that the editor should be free to consult as many or as few reviewers as he sees fit in connection with the acceptance of manuscripts, but one of us feels that a more specific policy, as suggested last year, might be desirable.

It has been suggested that titles be dropped from lists of "References Cited" as is done in *Science* and in the *Annual Review of Entomology*. The board with the complete concurrence of the editor expresses itself in full and complete opposition to any such proposal, titles constituting, in its opinion, an integral part of the information which adequate bibliographical citations should give.

The editor reports that technique notes are acceptable in the "Scientific Notes" section which was inaugurated with the July 1959 issue. One member of the board suggests we would welcome information about the proposed "Style Manual for Biological Journals." Another suggests he would like to see more papers on physiology, genetics, and ecology in the ANNALS.

Respectfully submitted,

FRANK N. YOUNG
JOHN J. PRATT, JR.
J. ALFRED ADAMS
LLOYD E. ROSEBOOM
MELVILLE H. HATCH, *Chairman*

Governing Board Action

The report was accepted by the Governing Board.

REPORT OF THE EDITORIAL BOARD

JOURNAL OF ECONOMIC ENTOMOLOGY

The *Editorial Board* is pleased to acknowledge the very excellent and efficient manner in which the managing editor, Dr. F. W. Poos, has again handled the JOURNAL OF ECONOMIC ENTOMOLOGY during the past year despite his greatly added responsibilities.

The Board has no specific recommendations to make at this time but would like to pass on to the Governing Board several matters which have come to its attention which we believe warrant your consideration.

1. The selection of a subject editor to assist Dr. Poos has been and will continue to be a major problem since at present it would be necessary for such a person to donate gratis the time required as well as to have available ample clerical assistance. The present constitution of the Society, we understand, provides that subject editors cannot be paid for their services.
2. There seems to still be a desire on the part of some of the membership to get the JOURNAL placed on micro-film or micro-cards.
3. One of the members of the Committee is of the opinion that consideration should be given to the policy of omitting titles in the "Reference Cited" section of the JOURNAL. He reports that all of the American Chemical Society journals are now using just author and a journal reference.

Respectfully submitted,

RUTH L. BUSBEY
G. J. HAEUSSLER
R. L. METCALF
D. E. HOWELL
E. L. CHAMBERS, *Chairman*

Governing Board Action

The report was accepted by the Governing Board.

REPORT OF THE EDITORIAL BOARD

MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA

The members of the Board have conducted all business by correspondence and by telephone calls between the Chairman, the Managing Editor and the Executive Secretary.

Immediately following the annual meeting of the Society in Salt Lake City, December, 1958, the participants in the symposium of Section D, Medical and Veterinary Entomology, proposed that the papers presented at the symposium entitled "Insecticide Resistance in Arthropods of Medical and Veterinary Importance" be considered by the Editorial Board, Miscellaneous Publications, as the first issue of MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA. It was pointed out to the participants in this symposium that one of the first responsibilities of the Editorial Board was the naming of an editor for the periodical. A. W. A. Brown, moderator at the symposium, volunteered his services as subject matter editor in order to expedite matters, provided his services were acceptable to all members of the Editorial Board. The Chairman immediately contacted other members of the Board concerning the matter and it was agreed that the symposium papers be circulated to each member of the Editorial Board and that the symposium papers collectively and individually would be considered on its or their merits. Following this procedure, it was unanimously agreed by members of the Editorial Board that the symposium papers were worthy of publication in an issue of MISCELLANEOUS PUBLICATIONS.

It is gratifying to the Editorial Board to announce that Volume 1, No. 1 of MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA appears with the date line October, 1959 containing four papers and a section on "Introductory Remarks", entitled "Resistance in Arthropods of Medical and Veterinary Importance—1946–58".

The Editorial Board, immediately upon its election, began the task of finding a subject matter editor. Several well qualified entomologists were recommended to the Editorial Board as candidates for the position of subject matter editor. After several exchanges of letters between all members, Jerome G. Rozen, Jr. was named as subject matter editor and he graciously accepted the appointment.

On September 15, 1959, Robert H. Nelson, Executive Secretary, wrote to the members of the Editorial Board,

stating that one author having a paper in Volume 1, No. 1 of Miscellaneous Publications, wished to place an order for 1500 reprints of his paper. In the Executive Secretary's letter, he referred to the specifications for MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA as given on page 38 of the March, 1959 Bulletin, which were adopted by the Governing Board, limiting the number of reprints of an article to 100. The Chairman of the Board wrote to the other members of the Editorial Board concerning the matter and stated that in his opinion this was a matter to be handled by the Executive Secretary and the Managing Editor or to be resolved by the action of the Governing Board. The Editorial Board is of the opinion that this question does not come within its jurisdiction. The Editorial Board of MISCELLANEOUS PUBLICATIONS, therefore, recommends to the Governing Board that this matter be reexamined and a new policy established or the Governing Board give the Managing Editor and the Executive Secretary authority to handle such matters in the future. When this regulation was approved by the Governing Board, it was the belief of the members that the issues of MISCELLANEOUS PUBLICATIONS would ordinarily contain a single article and that several articles in the form of a symposium were not anticipated, thus causing concern with the very first issue of MISCELLANEOUS PUBLICATIONS. It is also suggested that the Governing Board determine the advisability of numbering MISCELLANEOUS PUBLICATIONS by Volume or by consecutive numbers.

Respectfully submitted,

K. L. KNIGHT
RAY F. SMITH
NEELY TURNER
R. I. SAILER
B. B. PEPPER, *Chairman*

Governing Board Action

The report was accepted by the Governing Board. The policy regarding reprints and pagination per volume is now stated on the inside front cover of each issue of the periodical.

REPORT OF THE EDITORIAL BOARD

ENTOMA

One member of the Board, J. W. Apple, the Editor, and the Chairman of the committee met at the North Central Branch meetings in Columbus, Ohio, March 26, 1959, and discussed several matters relating to ENTOMA.

The following proposed recommendations were referred to the total Editorial Board for action:

1. That no clothbound copies of the 13th or subsequent issues of ENTOMA be made available. Paperbound copies are adequate, because it is revised biennially.
2. That the Board unanimously approve Dr. Fisher's reappointment as Editor.
3. That the Editorial Board recommend to the Governing Board the term of office of the Editor of ENTOMA be changed from five years to four. The four-year tenure will agree with the biennial publication of each issue. It recommends further that the necessary steps be taken to effectuate this by January 1, 1960, when Dr. Fisher starts his new term as Editor.

Three members of the Editorial Board favored the action. One failed to reply.

The Board's recommendation about changing the tenure of office of the Editor was referred to the Governing Board. It approved the recommendation.

Reference to amending the By-Laws to permit the change was brought to the attention of the ESA membership in the September 1959 BULLETIN.

The 13th Edition of ENTOMA was released at the end of 1959. The informational sections on insecticides, fungicides, and herbicides, and rodenticides were brought up-to-date by authors S. C. Billings, E. A. Walker, and W. W. Dykstra. An expanded section on sprayer calibration was prepared by O. I. Berge. Directory sections were made current by M. P. Jones and J. J. Davis.

On October 18, 1959, a check for $700 (made to the Entomological Society of America) was sent to the Executive Secretary R. H. Nelson. This check represents earnings on the 12th and 13th Editions of ENTOMA.

The Board wishes to commend Dr. Fisher as Editor and for his initiative as Business Manager of ENTOMA and his unofficial staff for the splendid 13th Edition.

Respectfully submitted,

J. W. APPLE
R. W. HARPER
W. C. MCDUFFIE
R. W. ROTH
M. P. JONES, *Chairman*

Governing Board Action

The report was accepted by the Governing Board.

REPORT OF THE EDITORIAL BOARD

THE THOMAS SAY FOUNDATION

Two manuscripts, both of interest and merit, were received early in the year. Thanks to excellent cooperation and expeditious handling by the printer, editor, and authors, the book selected by the Board was published on October 15, 1959, as the Foundation's sixth volume: "A Synoptic Catalog of the Mosquitoes of the World (Diptera, Culicidae)" by Alan Stone, Kenneth L. Knight, and Helle Starcke.

Respectfully submitted,

M. T. JAMES
H. T. DALMAT
L. E. CHADWICK
H. O. DEAY
C. W. SABROSKY, *Chairman*

Governing Board Action

The report was accepted by the Governing Board. The timely importance of this new book was noted.

REPORT OF THE COMMITTEE

INDEX TO THE LITERATURE OF AMERICAN ECONOMIC ENTOMOLOGY

INDEX XVI (for 1956–1957) went to the printer in August and was published early in November, 1959. For INDEX XVII (1958) approximately 20,000 references have been carded, but much indexing remains to be done before editing and revising can start. No indexing for INDEX XVIII (1959) has been done although the incoming literature has been searched daily and requests made for those publications that will require indexing.

Owing to lack of funds the appointment of the project's assistant indexer was terminated March 31, and the Library of the Department of Agriculture has carried virtually the entire burden of developing the INDEXES since that date. As was pointed out, however, in the Committee's report for 1958, the project can no longer be kept on an even approximately current basis without the employment of two full-time indexers supported by clerical assistance, and the Library cannot be asked to do more than it is doing now. Accordingly, the Committee developed and submitted to the National Science Foundation, a proposal requesting financial assistance for preparation of the INDEXES. A three-year program was outlined, involving requests totaling approximately $38,000. No action on this request had been taken up to the time of the preparation of this report.

In order to learn how well the INDEXES are serving the

needs of members of the Society, and in the hope of obtaining constructive and helpful suggestions for making them more useful, a questionnaire was prepared and circulated late in the year. A disappointingly small number (851) of the questionnaires were returned; but the "Yes" or "No" votes on certain questions, and special comments accompanying some of the questionnaires, will be helpful in the preparation of future INDEXES. A large majority of those members who returned questionnaires wish to see the INDEX continued. The response to a specific question on this point was as follows: "Yes"—81 per cent; "No"—6 per cent; "No opinion"—13 per cent.

Respectfully submitted,
W. A. CONNELL
W. C. MCDUFFIE
C. F. W. MUESEBECK, *Chairman*

Governing Board Action

The report was accepted by the Governing Board.

REPORTS OF SPECIAL COMMITTEES FOR 1959

REPORT OF EXHIBITS COMMITTEE

Nineteen exhibitors occupied booth space in the Founders Room and the Founders Foyer at the First Joint Meeting of the Entomological Society of Canada, Entomological Society of Ontario, and the Entomological Society of America at the Sheraton-Cadillac Hotel in Detroit, Michigan, on November 30 through December 3, 1959. Because some of the educational exhibits required more than one booth space, a total of 23 booth spaces was occupied by the exhibitors. The members were very interested in the well-planned industrial and educational exhibits.

The *industrial* exhibitors were as follows:

1. B & G Company—Plumsteadville, Pennsylvania
2. E. L. Bruce Company—Memphis, Tennessee
3. Dow Chemical Company—Midland, Michigan
4. Floridin Company—Tallahassee, Florida
5. Gandy Company—Owatonna, Minnesota
6. Gulf Oil Corporation—Pittsburgh, Pennsylvania
7. Shell Chemical Corporation—New York, New York
8. Stauffer Chemical Company—New York, New York

The *educational* exhibitors were as follows:

1. Armed Forces Pest Control Board, Armed Forces Institute of Pathology
2. American Institute of Biological Sciences
3. American Mosquito Control Association
4. Canada Department of Agriculture
5. Entomological Society of Canada
6. International Cooperation Administration
7. National Academy of Sciences
8. C. V. Riley Exhibit
9. U. S. Department of Agriculture, Plant Pest Control Division
10. U. S. Department of Agriculture, Plant Quarantine Division
11. U. S. National Museum

4-H Club Demonstrations—The 4-H Club exhibits were displayed in the main exhibit room and were viewed with great interest and much favorable comment. The following states were represented by exhibits:

Illinois	North Carolina
Indiana	Pennsylvania
Michigan	Utah
Montana	Wisconsin
New Jersey	Washington

Demonstration teams from Virginia, North Carolina, and Michigan presented "Insect-Tac-Toe", "Bees, See How They Live", "Cockroaches and Their Control", and "Insects in Plastic". These demonstrations were received with enthusiasm by the General Session of the members, an Extension Symposium, an Apiculture Symposium, and eight Detroit schools. A 30-minute television broadcast over UHF Channel 56 also featured the 4-H demonstrations.

Financial Statement—Total receipts were $1010.00, tota expenditures were $646.53, and net profit was $363.47.

Respectfully submitted,
A. C. DOWDY
G. L. HUTTON
H. B. IVES
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J. W. LEONARD
H. ELDON SCOTT
ARNOLD MALLIS, *Co-chairman*
D. B. WADDELL, *Co-chairman*

Governing Board Action

The report was accepted by the Board.

REPORT OF THE COMMITTEE ON THE PERMANENT HOME FOR THE SOCIETY

Beginning with the many excellent suggestions and valuable information made available through George Hutton's preliminary study for a permanent Society home in 1958, the Committee met with Ralph Heal in April of this year at the Elizabeth, New Jersey headquarters of NPCA. Ralph fully outlined the many problems (and pitfalls to be avoided) which he encountered in the choice of the location, the actual purchase and maintenance of such a property. With such information as a frame of reference for our exploration of a suitable location and cost of such a home in the vicinity of Washington, D. C., the Committee then met (with F. W. Poos serving in an advisory capacity) in Washington on May 5, at which time an unhurried day was spent inspecting likely locations and visiting three different buildings, two in the District of Columbia and one in College Park, Maryland. From every standpoint, it appeared that a suburban location was not only most desirable, but was requisite from the standpoint of initial cost, taxes and availability of part-time maintenance help. At a final meeting in New York in early June, the Committee reviewed the numerous aspects of the problem and framed the recommendation dated June 12, 1959, which was incorporated in Letter Number 2 (dated July 12, 1959) to the Governing Board from President Paul Oman.

In view of the recommended action of President Paul Oman in Letter Number 2, it is obvious to the Committee that it has fulfilled its original function to study the problem of the permanent home for the Society and to make recommendations (as has been done in our letter of June 12, last). The Committee is especially appreciative of Ralph Heal's important guidance and advice at the outset of its activities and to George Hutton, whose Preliminary Report served as an important reference in our thinking and recommendations. The Committee is also grateful to F. W. Poos, George Langford, T. A. Bissell, R. A. Fulton, A. H. Yeomans, R. A. St. George, George Hutton and President Paul Oman and President-Elect M. P. Jones for their time spent in inspecting the College Park site.

Respectfully submitted,
R. H. NELSON
NEELY TURNER
MORRIS ROCKSTEIN, *Chairman*

Governing Board Action

The report was accepted by the Board. See also the report of the *Committee on Finance.*

REPORT OF COMMITTEE ON LOSSES CAUSED BY INSECTS

At the time of the Society's meeting in Salt Lake City the *Committee on Insect Losses* as then constituted held a full evening meeting. The previous years report (*Bull. Ent. Soc. Amer.*, 5: 35) was reviewed and possible methods of intensifying interest in insect losses among our total society membership were discussed. It was suggested that the committee members work among their own Branch membership in an effort to involve more workers.

The committee notes that some papers dealing either with insect-caused losses directly or with indexes for calculating losses have appeared in print during the year and that these may be attributable in part to its activities.[1] Parallel *Committees on Insect Losses* have been established in the Eastern Branch, the Pacific Branch and the Southwestern Branch. The desirability of establishing such parallel committees in the North Central Branch and the Southeastern Branch has been taken under consideration by those Branches respectively. At the March meeting of the North Central Branch in Columbus, Ohio, considerable interest in loss data and emphasis on methods of obtaining more adequate loss data was generated through a series of a dozen or more papers and discussion topics (*Proceedings North Central Branch, E.S.A.*, Vol. XIV, 1959).

It is noted that committees with assignments and objectives comparable to those of this E.S.A. Committee but dealing specifically with plant diseases, weeds, nematodes, and vertebrate pests have been or are being established in societies or other National agencies concerned with those organisms. Further, it has been proposed that the Committee on Agricultural Pests of the Agricultural Board, National Academy of Science—National Research Council, transfer its activities as they relate to the problem of losses caused by pests to these parallel society committees. As an approach to this end and as an aid toward coordinating activities and further stimulating interest, representatives of the several Society committees are being invited to meet with the NAS-NRC Committee in a two-day workshop being held at the National Academy of Science Building on November 4 and 5. President Oman and President-elect Jones have also been invited to attend the work session.

Among some society members there has developed a question regarding the possible overlapping assignment of this E.S.A. Committee and the earlier established standing *Committee on Insect Surveys.* Realizing the long range nature of its committee assignment and in view of the importance of the question of insect losses to our profession your committee recommends (1) that the Society activities relating to insect losses be continued and intensified; (2) that the Governing Board give consideration to the question of consolidation of the functions of the *Committee on Insect Losses* with those of the *Committee on Insect Surveys.*

Respectfully submitted,

W. G. Eden
Leo G. K. Iverson
John Medler
C. R. Parencia
J. N. Roney
H. M. Harris, *Chairman*

[1] See appended list.

Some Recent Publications Relating to Insect Caused Losses and their Evaluation

(not intended to be exhaustive—but cited as indicative of progress and for discussion)

1. The Relation of Stable Fly Abundance to Milk Production in Dairy Cattle. Bruce, W. H. and G. C. Decker. *Jour. Econ. Ent.*, 51 (3): 269–274, 1958. (A 3-year study shows an average monthly loss in milk and butterfat production during the summer of 0.65% and 0.7% per fly per cow).
2. The Effect of Biting Fly Control on Weight Gain in Beef Cattle. Cheng, Tien-Hsi. *Jour. Econ. Ent.*, 51 (3): 275–278, 1958. (Biting fly control at a cost of .01¢ per animal per day for materials resulted in increased daily gains of 0.5 to 0.66 lbs.).
3. Estimation of Red Clover Yield Losses Caused by the Clover Root Borer. Pruess, K. P. and C. R. Weaver. *Jour. Econ. Ent.*, 51 (4): 491–492, 1958. (In Ohio in 1956, a population of 1.5 borers per root resulted in hay yield reduction of 5.5%).
4. Damage to Corn in Louisiana caused by Stored-Grain Insects. Floyd, E. H., Oliver, A. D., and Powell, J. D. *Jour. Econ. Ent.* 52 (4): 612–615, 1959. (At harvest time 10% of corn kernels show insect damage. In storage this increases to 17% by following May and 30% by July).
5. Tobacco Foliage Loss to Hornworms and Budworms in North Carolina, 1957 and 1958. Farrier, G. H., Guthrie, F. E., and Rabb, R. L. *Jour. Econ. Ent.*, 52 (4): 761–762, 1959. (Losses averaged $5.49 and $3.69 per acre of flue-cured and burley tobacco, respectively, in 1958).
6. The Effects of the European Corn Borer, *Pyrausta nubilalis* (Hbn.), on Corn Yield. Kwolek, W. F. and Brindley, T. A. *Iowa State College Journal of Science*, 33 (3): 293–323, 1959.
7. Effects of Chicken Body Louse Infestation on Egg Production. Gless, Elmer E. and Raun, Earle S. *Jour. Econ. Ent.*, 52 (2): 358–359, 1959.
8. Effects of Heavy Fall Infestations of Spotted Alfalfa Aphids on Subsequent Spring Growth of Alfalfa in Kansas. Burkhardt, E. C. *Jour. Econ. Ent.*, 52 (4): 642–643, 1959.
9. Comparative Yields of Cotton in Treated and Untreated Plots in Insect-Control Experiments in Central Texas 1939–1958. C. R. Parencia, Jr. *Jour. Econ. Ent.* 52 (4): 757–758, 1959. (Over a twenty-year period there was, in field experiments, an average per acre increase in production of seed cotton of 42% where insect control was carried out.)
10. Reduction of Corn Yield by First-Generation Southwestern Corn Borers. Arbuthnot, K. D., R. R. Walton and J. S. Brooks. *Jour. Econ. Ent.*, 51 (6): 747–749, 1958.
11. Insect Losses to Apples in the United States. D. W. Hamilton. *Proc. North Central Branch ESA*, XIV: 17–20, 1959. (Without insect control loss would be 40% to 99% of the crop. With control the loss including cost of protection, approximates 36 million dollars annually).
12. Field Tests of Insecticides Against Paddy-Borer in Taiwan from 1953–1956. Chia-Hwa Tao. *Jour. Econ. Ent.*, 51 (5): 571–573, 1958. (Estimates of field losses to the rice crop, based on these control studies, are given as 10%–30% annually).
13. Florida Insect Pest Summary—1957—(Mimeograph).
14. Florida Insect Pest Summary—1958.
15. Timber Resources for Americas Future—*Forest Resources Report No. 14.* January 1958. "pp. 185 et seg give detailed report on insect and disease losses." (teste L.G.K.I.).

Governing Board Action

The report was accepted by the Board. In regard recommendation (2) the Board's action is detailed under the report of the *Committee on Insect Surveys*. See also the report of the *Committee to Review the Committee Structure of the Society*.

REPORT OF THE COMMITTEE ON PUBLIC RELATIONS AND WELFARE

Only one definitive assignment has been made to this committee; that is a consideration of the resolution proposed by the Eastern Branch at their 1958 meeting. The conclusion was reached that it will serve no good purpose to attempt to publicize this resolution.

The resolution of the American Mosquito Control Association of February 26, 1958 is a model of its kind—but it will get no publicity beyond the narrow confines of those professionally interested.

The resolution in Mosquito News of June 1, 1959 is fine. However, these last two resolutions are preaching to the converted; they will not appeal to, nor will they reach the repentent sinner, the scare headline writer, or his public.

Your committee doubts the value of such resolutions. Accustomed as the American public is to a constant barrage of propaganda, only constant repetition will have any permanent ill effects. Against this possibility, your committee approves certain recommendations for your consideration.

Your committee recommends:

1. That the *Public Relations and Welfare Committee* be made a standing and continuing committee;
2. made up of five members—a chairman, and four others.
3. The chairman and one other member would be replaced each year. If a continuing member were to be made chairman, then two new members would be appointed for that year.
4. The members of the committee would be chairmen of the following sub-committees:
   - A. Legislative. The member in charge of this sub-committee should be from the Washington area. It would be the duty of this sub-committee to be aware of any legislation affecting Entomology and to channel the information promptly to the officers of the Society.
   - B. Industry liaison. This member should preferably be drawn from industry. It would be the duty of this sub-committee to maintain close contact with chemical and pesticide trade associations.
   - C. Liaison—public. This member should be able to allocate to his sub-committee members, the job of monitoring garden club publications, wild life associations and so on. The file of this group would consist largely of clippings, organized in such fashion that "public opinion" trends could be noted. The probability is that both classes of organization follow rather a restricted pattern and once this was clear, suitable steps could be taken, *ahead* of time. The AIBS representative should be an ex-officio member of this committee to ensure liaison with allied professional societies.
   - D. Official liaison. Since so much of entomology is public supported, either Federal or State, the need for adequate representation and responsibility for this group is clear. The member in charge of this sub-committee might preferably be an extension entomologist and his sub-committee be organized on a regional basis, complete with extension editors! The duties of this committee would be onerous. They should know *in advance* of any major control program that is planned, and working in conjunction with the Public and Industry liaison sub-committees encourage, through existing channels, the dissemination of suitable advance public information.

Your committee has considered the suggestion that the Society engage in direct contact with the public on the journalistic level. With this we do not agree. Anything short of an extremely expensive continuing program would be of relatively little value. For future consideration, the idea of a series of popular articles that could be syndicated to pay the out-of-pocket expense is suggested.

Members of the Society should also be encouraged to develop articles and releases on the local level in their own communities. A more immediate possibility is to follow the example of other societies, such as Sigma Xi and use national lecturers, but on a popular level. The current availability of funds from national sources to encourage entry of students into scientific fields might well be investigated to this end.

The Society's welfare: This problem is broad and with long range implications. Involved deeply are the professional standards of the Society, standards which have yet to be stated or prescribed. But whether we achieve professional status in the legal sense that medicine and architecture have, we still have to recognize that we have a duty to society that transcends formal procedure or definition. There are many in the Society who would like both, but it is reasonable to suggest that very few, perhaps none, of our members are sufficiently aware of all the ramifications of Entomology to be competent to lay the foundations for the establishment of full professional standards to which we could require our members to subscribe.

Furthermore, few, if any, of our members have the information necessary to determine whether the development of entomology, particularly with respect to the allocation of public funds, is well balanced. With these considerations in mind, your committee recommends:

That representation be made to national funds to provide for a thorough-going inquiry into the whole field of entomology—its contributions to knowledge, its impact on the health of people and animals, its contribution to material comfort, its defense of the food supply in the nation, its relationship to industry, its part in the United States international program, and last, but not least, the educational and technical standards that it requires of its practitioners.

Respectfully submitted,

J. A. Beal
J. M. Cochran
J. C. Gaines
Robert Glen
Herbert Knutson
R. I. Sailer
Walter Carter, *Chairman*

Governing Board Action

The Board accepted the report. The Board voted to delete "and welfare" from the name of this committee and that it remain as a special committee entitled the *Committee on Public Relations*. The Board was in agreement with the committee recommendations regarding its functions as detailed in the report. See also the report of the *Committee to Review Committee Structure of the Society*.

REPORT OF THE COMMITTEE TO REVIEW THE COMMITTEE STRUCTURE OF THE SOCIETY

The special committee appointed by President Oman to review the committee structure of the Society has considered two aspects of the problem: (1) the responsibilities of the various continuing committees, both standing and special, with a view to eliminating duplication of effort and function, and (2) the appropriateness of the classifica-

tion of each committee falling in one or the other of the two categories.

In its study of possible overlap of responsibilities and functions, we have conferred with a number of past and present chairmen of standing and special committees, with several members of the Governing Board, including those responsible for suggesting the composition of various committees, and have also drawn upon our own experience in recent years as members of various committees. The net result of this inquiry has been that the only problem in the area of committee responsibility which we could discover involved the standing *Committee on Professional Training and Standards* and the special *Committee on Public Relations and Welfare*. However, the 1959 report of the latter committee, which is now before the Board, proposes standing committee status with clearly defined functions. Until such time as the Board has considered the recommendation of the *Committee on Public Relations and Welfare*—no recommendation is made regarding its possible relation to the *Committee on Professional Training, Standards and Status.*

In considering the appropriateness of present committee classifications, account was taken of the fact that our present standing committees have been established generally for continuing functions of a class with which the Society is presumed to be permanently concerned. Problems with which the Society is likely to be concerned for definite periods of time or for relatively short but indefinite periods, have been met usually through the appointment of special committees.

Standing Committees. Article X of the Constitution recognizes five standing committees as follows: *Program, Membership, Entomological Nomenclature, Common Names of Insects* and *Insecticide Terminology.* Upon subsequent recommendations of the Governing Board, the Society established two additional standing committees in 1954: *Insecticide Reference Standards*; and *Insect Survey*, two others in 1956: *Finance*; and *Professional Training, Standards and Status.* With the possible exception of the last (see above), we have no recommendations to make regarding the functions or future status of these nine standing committees.

Special Committees. On the basis of the criteria stated, at least three of the several continuing special committees serving in 1958–59, might be given consideration as potential standing committees.

Committee on Memorial Lectures. Presently a 5 member special committee appointed by the Governing Board. Since the Memorial Lectures now appear to be established as a permanent feature of the annual meeting, we recommend that this special committee be established as a standing committee.

Committee on Public Relations and Welfare. Presently a 5 member special committee appointed by the President. Recommendation deferred pending action by the Governing Board upon the proposals of the 1958 *Committee on Public Relations and Welfare.*

Committee on Losses Caused by Insects. The 1958 special committee appointed by the President, conceived of its functions as long range and its task continuing. If the Governing Board concurs in this estimate, the committee might well be considered for status as a standing committee. We have no recommendation to make in this matter.

Respectfully submitted,

K. L. KNIGHT
C. M. MEADOWS
E. G. LINSLEY, *Chairman*

Action of the Governing Board

The report was accepted by the Board.

In regard to the *Committee on Memorial Lectures* the Board voted to recommend to the membership at the final business meeting that this be established as a 5 member standing committee.

The Board actions regarding the *Committee on Public Relations and Welfare* and the *Committee on Losses Caused by Insects* are shown after the reports of these committees elsewhere in this publication. See also comments following the report of the *Committee on Insect Surveys.*

ENTOMOLOGICAL SOCIETY OF AMERICA—1960

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Executive Secretary.....R. H. NELSON

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Stephen L. Wood, Provo, Utah.....(1962)
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Lloyd O. Warren, Fayetteville, Arkansas.....(1960)
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Committee on Insecticide Terminology

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J. Everett Bussart, Wheaton, Illinois.....(1962)
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B. N. Smallman, Ottawa, Ontario.....(1960)
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Rosmarie von Rumker, Kansas City, Missouri.....(1962)
Lynn H. Dawsey, Tifton, Georgia.....(1961)
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Dale R. Lindsay, Bethesda, Maryland.....(1961)
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ENTOMOLOGICAL SOCIETY OF AMERICA, DETROIT MICHIGAN, DECEMBER 3, 1959

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FROM THE MANAGING EDITOR'S DESK

MORE ABOUT ABSTRACTS.—A great many manuscripts are still being received for publication without the required abstracts. Why should it be so difficult to get authors to furnish abstracts of *all* papers (scientific notes as well as the longer papers) submitted to the Society for publication in the ANNALS, the JOURNAL, or the MISCELLANEOUS PUBLICATIONS? This requirement has been publicized in the BULLETIN (also in the ANNALS and in the JOURNAL) for the past 33 months. The latest discussion of the matter appeared in the latest issue of the BULLETIN volume 5, page 222.

A manuscript submitted for publication without being accompanied by the required abstract is not in acceptable form. Therefore it now seems necessary to delay assigning the date of acceptance of such manuscripts until this requirement has been met. It is regretted if this action seems too harsh, particularly because in most instances the date a manuscript is first received in the Society's office also becomes the date of its acceptance for publication, unless substantial revisions by the author are required or delay in return of the manuscript for other reasons occurs. Frequently, however, the revisions made are so minor in nature that it seems unfair to the author to delay the date of acceptance of his manuscript until all revisions have been made, especially if there has been excessive delay in obtaining the comments of reviewers.

DELAY IN PUBLICATION.—Of much concern to the Society during recent months is the ever increasing volume of manuscript material that is being submitted for publication, particularly in the ANNALS, the BULLETIN, and the JOURNAL. The increase in number of pages published in 1959 compared with 1958 was as follows: ANNALS, 785–618, 27%; BULLETIN, 232–136, 70%; JOURNAL, 1262–947, 33%. Because the costs of publishing this increased volume of material are increasing faster than the income provided for this purpose it is imperative that more care be exercised in screening manuscripts submitted for publication. This means that because of the increased volume of material handled and because of the need for giving more careful attention to it, more time is needed and that the former goal of publishing all manuscripts within 5 to 7 months after their acceptance in final form cannot be attained as well as formerly. It is hoped that authors will continue to be cooperative and that they will not become perturbed if unexpected delay in publishing their manuscripts is encountered.

Contributing to the increased delay in publication of articles in the JOURNAL is the fact that the George Banta Co. now requires receipt of manuscript copy a minimum of 90 days in advance of the scheduled date of issue (75 days for "paid" material).

REFERENCES CITED.—The proposal that titles of references cited in the JOURNAL and in the MISCELLANEOUS PUBLICATIONS be omitted as is done in chemical journals, in *Science*, and in the ANNUAL REVIEW OF ENTOMOLOGY was referred to in the latest issue of the BULLETIN, volume 5, page 222. Some expressions of opinion from members of the Society have been received. The comments received were overwhelmingly in favor of retaining the titles in the "References Cited." Accordingly, no change in the form used in the past will be made at this time.

BOOK REVIEWS

PREVENTIVE MEDICINE IN WORLD WAR II, by the Medical Department United States Army. Obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., as indicated for each of the volumes reviewed here.

It is not possible in the limited space allowed to prepare an adequate review of the material given in over 1,200 pages of these three volumes. The reviewer therefore sought only to cover the subject matter. However, he believes this should be sufficient to recommend them to those who may desire to learn something of the Army Medical Corps' outstanding efforts during World War II.

Volume II. ENVIRONMENTAL HYGIENE. 1955. 404 pp., illus. Cloth, $3.50. (Catalog No. 104.11: P 92/v.2).

This volume will be of special interest to veterans because it explains the tremendous problems the Army is faced with in providing shelter, food, and water, and sanitary facilities for millions of troops. Many who were critical of these features will doubtless temper their feelings on realizing, perhaps for the first time, the magnitude of the problems involved. One inevitably feels in retrospect that things were not nearly as bad as they seemed and that on the whole marked progress was made during the war years.

The chapters on insect and rodent control are somewhat disappointing in that they do not tell the full story of the accomplishments of entomologists, parasitologists, and sanitary engineers. However, this shortcoming is compensated for by the excellent summary of the research developments on insect and rodent control and their value both to the military services and to the general public.

The chapters on the foreign quarantine and preventive medicine programs in ports show that military leaders were acutely aware of the importance of preventing the introduction of harmful diseases of man and animals, insect pests, and plant diseases into the United States. The authors conclude these programs had certain de-

ficiencies and the results were not perfect. However, it seems to the reviewer that the programs were miraculously successful, considering the amount of personnel and cargo moved so rapidly during the war years.

Volume III. Personal Health Measures and Immunization. 1955. 394 pp. illus. Cloth, $3.25 (Catalog No. D104.11 P92/v.3).

The first chapter of this volume describes the physical standards used in selecting manpower. The policy was one of elimination of all persons unfit physically or mentally. This was necessary from the standpoint of efficient Army operations, minimizing hospital needs, and above all to minimizing future payments for disabilities.

The second chapter describes personal hygiene policies and emphasizes the importance of enforcing the proper procedures to maintain good health among troops. This was no easy task in the best environments and it was extremely difficult under the wide range of conditions in foreign theaters.

Chapters III, IV, and V are on clothing, nutrition, and malnutrition and deficiency diseases. The importance of food and clothing in maintaining good health and morale are vividly described. It is rather sobering to realize that the clothing and food available to troops was so woefully inadequate in certain areas, especially during the first 2 or 3 years of the war. No one should be criticized for this because the Army had neither the experience or time to cope with the varied problems facing troops. Here, as in many other areas, experience and research resulted in remarkable progress in solving many problems by the end of the war.

At the outset of the war there was no organized program of preventive psychiatry in the Army. However, once organized, the psychiatrists proved of inestimable value. Their work in eliminating unstable individuals and the mentally impaired in training centers and in classifying men according to their abilities and interest contributed to the stability and efficiency of the entire Army. However, perhaps their most important contribution was the rehabilitation of psychiatric casualties. The development of psychiatry, its objectives, and progress is a fascinating story and will temper the opinions of those who are prone to ridicule this profession.

Chapter VII, "Accidental Trauma" gives statistics on the losses in manpower caused by diseases and nonbattle injuries. It is especially shocking to learn that there were over 60,000 deaths from nonbattle injuries, a rate of 2.40 per thousand per year, or four times the deaths from disease. The analysis of the nature and causes of accidents is of distinct interest. As the war progressed a gradual decline in accident rates occurred as a result of prevention programs. The methods of prevention employed in various areas are discussed in detail.

The final chapter covers in great detail the Army immunization program for the prevention of smallpox, tetanus, cholera, typhus, and various other diseases. Details concerning the agents used and methods employed are given for the specific diseases. The effectiveness of this program was reflected in the very low incidences of all the diseases among troops during the war years.

Volume IV. Communicable Diseases. 1958. i–xxi + 504 pp., illus. Cloth, $5.50.

Part 1 of this volume consists of a lengthy but excellent general discussion of communicable diseases and their importance in military operations. The author presents statistics on various diseases and discusses their incidence in the various theaters of operation. The second part deals with viruses, bacteria, and other diseases, transmitted chiefly through the respiratory tract. There are specific chapters on chicken pox, common respiratory diseases, influenza, measles, rubella, mumps, and psittacosis, diphtheria, meningitis, the pneumonias, streptococcus, tuberculosis, whooping cough, and coccidiodomycosis. Most of the chapters are short but adequately cover the incidence of the diseases during World War II, and the measures taken to combat them.

The final part covers diseases transmitted chiefly through the alimentary tract. Nearly 100 pages are devoted to diarrhea and dysentery. This is followed by three chapters on food poisoning and three chapters on bacterial infections such as brucellosis, cholera, and typhoid and paratyphoid fevers.

The final section of the volume is devoted to parasitic infections. It consists of chapters on amebiasis and on nematode and cestode infections.

The pattern of presentation is essentially the same for each chapter in this volume. Most of them give a history of the disease, its incidence in various theaters, and what was done to minimize them. While there are a few instances in which methods of control were inadequate, one must still conclude that the Army Medical Corps accomplished near miracles in minimizing many diseases which in previous wars caused far greater casualties than enemy action.

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Men and Moments in the History of Science, edited by Herbert M. Evans. University of Washington Press, Seattle 5, Washington. 229 pp. 1959. Price $4.50.

Only the third of nine essays in this book is reviewed here. It is entitled, "Charles Fuller Baker, American Entomologist." This sketch (pp. 38–56) of the life and work of Charles Fuller Baker, by E. O. Essig who studied under him at Pomona College, testifies to the inspiration that his students received from that close association. There is ample evidence of the enthusiasm and drive that carried Baker through a life time of intense effort, despite the ill health which beset him always towards his goal of biological research.

We are told of the collections he made in the different parts of the world in which he worked. His ability to interest and enlist others contributed in an important degree to these collections.

Since the latter years of his life were spent in the Philippines a great deal of the information covering his activities in those years comes from his friends there. A picture of the conditions under which he lived and worked during this period is presented by quotations from men who worked with Baker at the College of Agriculture at Los Banos.

From the author and from these friends the impression is gained that many otherwise excellent teachers seem to lack that certain spark that serves to ignite the zeal of their students. Baker had it. There are many good naturalists who are not scientists and many good scientists who are not naturalists. Baker was both. There are many well-trained scientists who do not grasp the economic significance of their subjects. Baker was constantly translating the results of research into practical procedures.

A. S. Hoyt

Annual Review of Entomology, Volume 5. 1960. Edward A. Steinhaus, Ray F. Smith, Editors, University of California. 8vo., cloth, 451 pp., illus., Published by Annual Reviews, Inc., in co-operation with the Entomological Society of America. Palo Alto, Calif., Annual Reviews, Inc., 1960. $7.00.

The genesis and organization arrangements pertaining to the series of which this forms the fifth volume already have been recorded elsewhere and probably are generally known by this time. The series appears to have passed through its "baptism of fire," and, we trust has taken its place throughout the world as an accepted and stabilized publication in entomology. Each volume is issued only after a period of arduous work, study, and thorough analysis in which specialists in the various fields of entomology have prepared for their colleagues and others